

# Contractors and Engineers Monthly

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## PICKS and SHOVELS

By O. E. POTTER

### California Has a Word for It

One of our readers in California, B. G. Marshall of the California Corrugated Culvert Co., has responded to the challenge of the February Picks & Shovels, in which we asked for the right word to describe the misappropriation of highway funds for other than highway construction and maintenance uses which has been going under the misnomer "diversion".

Mr. Marshall quite agrees with the inappropriateness of the term, calling it altogether too feeble as well as inexact, and suggests what we are inclined to agree is the right one—embezzlement!

### Asphalt a la Naturel

So much has been written about Trinidad's famous Asphalt Lake that there seems to be little left to add to the saga of natural asphalt, even by the most interested and enthusiastic recent visitor. Perhaps one might begin by exploding some of the myths about the Lake which have become so prevalent, due no doubt to the inevitable false impressions gained by the thousands of tourists driven the 60 miles from Port of Spain to Brighton and informed upon arrival "There it is."

The most popular bit of misinformation is that the Lake constantly replenishes itself. This has resulted undoubtedly from questioning by visitors of some of the workmen who tell them that they have been digging in the same spot for months, or years. This is substantially true. There are no evidences of the excavations from which more than 5,000,000 tons of asphalt have been removed, because beneath the surface of the lake (which by the way looks more like the skin of an elephant than of anything else I can think of in the way of descriptive terms), the asphalt is a shifting gas-impregnated mass which seeps up into holes and crevasses, refilling them again as they are made. However, during the process, the level of the lake is slightly lowered,—to the extent of about 20 feet in the last half century.

(Continued on page 37)



C. & E. M. Photo

Scene at Asphalt Lake, Trinidad

## Rock Production For Channel Paving

Santa Ynez Canyon Quarry Furnishes Three Sizes of Rock for Bank Protection in Los Angeles County, Calif.

(Photo on page 56)

TO furnish rock for paving the banks of rivers and flood control channels which are being constructed as a part of the flood control program in Los Angeles County, Calif., the United States Engineer Department is operating a quarry in which the average production for some weeks has been in excess of 5,000 tons daily. The quarry is located in Santa Ynez Canyon in the Santa Monica Mountains about 3 miles inland from the point where Sunset Boulevard meets the Coast Highway, U. S. 101. Three of the four faces operated are located on the floor of the narrow canyon, while the fourth is located near the summit of the range about 2 miles up a side canyon.

Production of three sizes of stone is required: spalls, rock up to a maximum of 6 or 7 inches; toe trench rock, irregular shaped pieces up to 2,000 pounds; and paving stone, rock up to 400 pounds, of as regular a shape as possible. The rock in the quarry consists of an unusually hard and heavy grey sandstone from three faces, and a laminated limestone from the higher face. All material in place is badly shattered

(Continued on page 17)

## Details of 5.6-Mile Dual-Type Paving Job Near Carlisle, Penna.



C. & E. M. Photo

Dustless Delivery of Bulk Cement to the Rubber Batch Bags in the Truck Below

THREE distinct operations featured Federal Aid Project 2791-E on U. S. 11 extending east from Carlisle, Pa., for a distance of 5.64 miles. This contract, awarded to H. W. Shaull & Son of Mechanicsburg, Pa., for \$271,183.39, was completed during the 1936 construction season. The grading, while not exceedingly heavy, required the removal of numerous knobs of the tough limestone for which Cumberland County is noted. Two 10-foot lanes of 10-8-10-inch concrete were laid. Suitable drains were placed within the 10-foot center lane, which was later paved with a crushed aggregate base course and a 2 1/4-inch bituminous surface course.

## Contract for Concrete Paving with Bituminous Center Lane Completed by H. W. Shaull & Son

(Photos on page 56)

### Grading

Grading was started on April 20, 1936, with the slow ripping up of the old well-compacted bituminous macadam. The old road followed the contour of the ground while the new pavement followed a definite grade. This required knocking off numerous knolls and humps where outcrops of Cumberland County limestone had thwarted the attempts of early road builders.

The contractor used two portable air compressors, one Ingersoll-Rand and one Metalweld-Worthington, and three I-R jackhammers for drilling the limestone. After blasting, the rock was removed with a Lorain 75-B and a Bucyrus-Erie 1 1/4-yard shovel.

As the new paving included two 10-foot concrete strips with a 10-foot bituminous strip between and shoulders 8 to 10 feet wide, the new grade was finished to a maximum width of 50 feet.

### Batching and Cement Handling

The batching plant was located about 3 miles dead haul from the center of the job on a railroad siding in Mechanicsburg. Crushed stone for aggregate was hauled about 5 miles from the quarry of Hempt Bros. at Everly's Mills and also from the contractor's own quarry at Locust Grove about 3 miles from the Carlisle, or west end, of the job. These quarries also furnished the crushed stone for the base course of the center strip. The stone was stockpiled and rehandled to the Blaw-Knox bins and batchers with a Lorain 75-A crane

(Continued on page 18)

## Modern Highway Design Has Increased Excavation Per Mile of Road But Unit Costs Have Dropped

By E. L. ROETTIGER,  
State Highway Engineer of Wisconsin

THE demand made upon modern highway construction equipment by the change in dimensions of highways is astounding. The typical sections in the diagram on page 33 compare the physical dimensions of the roadway of a primary rural highway of fifteen years ago and today. The older design was, at the time of construction, considered as meeting adequately the prevailing and anticipated highway transportation demands. Other features characteristic of the time were grades up to 8 per cent, with sight distance at the apices of grades as low as 300 feet and changes in direction accomplished with curves with radii as low as 500 feet.

Present day design for the same highway, in addition to the increase in the lateral dimensions shown, is characterized by grades of 5 per cent or less, sight distance at the apices of grades of 800 feet or more, and horizontal curves with radii exceeding 1,000 feet, super-elevated or banked to permit speeds up to 70 miles per hour. Present designs

are further characterized by the tendency to hold to improved standards of alignment and grade when obstacles are encountered, even at the expense of large volumes of costly work.

### Quantities Increase

The result of these changes is that the amount of work and quantities of material required to build one mile of highway have steadily increased. The volume of excavation handled per mile of roadway in the earlier designs was from 5,000 to 10,000 cubic yards on ordinary work and volumes up to 20,000 cubic yards were considered exceedingly heavy work. In grading to present standards 20,000 cubic yards per mile is considered and accepted as quite ordinary work, and volumes exceeding 40,000 cubic yards per mile are not unusual. Pavement width, for two lanes of traffic, has increased from 16 feet to 20 feet, and at this time 22 feet is advocated. Increased width of roadbed and pavement has necessitated corresponding increases in the width of structures, with the result that structural quantities per mile have more than doubled.

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# Cape Cod Canal Highway

## Parking Areas Provided For Visiting Tourists

**Eastern Contracting Co. Completes Scenic Road With Problems of Fill, New Guard Rail, Curb**

(Photo on page 56)

THE new highway on the north shore of the Cape Cod Canal, connecting the new Bourne and Sagamore, Mass., highway bridges which link the resort areas of the Cape with the mainland, was opened to the public in October. The widening of the canal made necessary the removal of sections of the old highway and the new bridges required a new connecting link. Much credit is due the Location Engineers of the Massachusetts Department of Public Works for the manner in which the new road is laid out, with large parking areas for the hordes of summer visitors who gather every night to "see the boat go through". The increasing traffic in the canal led to the construction program of bridges, widening the canal, and new roads, but the real event of the 24 hours is the east-to-west transit of the Boston-New York boat between eight and nine each evening. The paved parking areas, daylighted spoil banks and judicious trimming of trees makes "seeing the boat go through" a greater pleasure than ever before, despite the mosquitoes.

### Parking Areas

Seven large parking areas of various dimensions are located strategically to open up long vistas of the Canal. Each parking area is separated from the traveled way by broken white lines. The largest area for parking is 1,222 feet long and 74 feet deep. If cars were parked systematically in three rows for the length of this area, over 600 cars could be parked in this space alone.

The subgrade of each parking area was to have been hardened with 4 inches of loam or clay but because of the large amount of gravel which had to be wasted on the job, that material was used instead. On top of the consolidated gravel a 2½-inch bituminous macadam top was laid in a manner similar to the construction of the main highway.

### Difficult Cuts and Fills

The largest single fill in the 3.122-mile length of this 40-foot roadway was not made by the contractor but was made by the United States Engineer Department from canal excavation by contract. This fill was located adjacent to the traffic circle at the north end of the Sagamore Bridge. It consisted of 132,340 cubic yards of material placed over a distance of 700 feet and to a depth of



C. & E. M. Photo

Marking the Broken Line Which Separates the Main Highway from a Parking Area

65 feet by LeTourneau Carryall scrapers.

The first large cut at the Bourne end of the contract of the Eastern Contracting Co., which started clearing and grubbing on March 11, 1936, and actual excavation on March 19, consisted of 13,600 cubic yards taken out to form a parking area and hauled west to the end of the job where an 18,800-cubic yard fill 200 feet long and a maximum height of 26 feet was made. The excavation in this section was done with a Lorain 75-A and a 75-B loading to a fleet of 5-ton Sterling trucks owned by the contractor. The material was spread in 1-foot layers by two Allis-Chalmers Model K tractors with Baker bulldozers. This material was practically all sand and was compacted by the travel of the tractors and trucks with no rolling or wetting.

Most of the cuts and fills on this job were side hill with several parking areas in cuts as described above. The slopes of all fills were made 2 on 1. On all steep ground slopes, where the old ground was parallel to the finished slope, the ground was notched out to hold the fill. Lower notches of this type were made wide enough with the shovels so that trucks could run in from the bottom of the fill. The upper key notches were made by the bulldozers.

One fill of 13,250 cubic yards was 26 feet at the center line and 40 feet deep at the outer edge and located in a V-shaped declivity. This fill was 100 feet long on the grade base line and only 20 feet long at the bottom. The narrowness of the fill at the bottom made it a problem in compaction because the fill was entirely of sand. The contractor used a diagonal drive for the trucks to move down the face of the declivity and then his compaction problem was solved when the adjacent cuts turned out to be a good gravel, with cobbles up to 3 cubic feet, which compacted well with no settlement. On this cut and fill the contractor used one shovel, two trucks and a bulldozer which worked fast and made the complete fill in a few days.

A large cut of 144,220 cubic yards and about 1,800 feet long was located approximately 7,600 feet from the Bourne end of the job. The excellent gravel from this cut which would normally be used for the foundation of the roadway was wasted in the fills because there was an excess of gravel at the top of the cut. However, the contractor did save the top gravel for the foundation course on 1,800 feet of 6 per cent grade because he wanted a good foundation over which to haul material to another section of the job.

A 900-foot cut 7,400 feet from the Sagamore end of the job contained some interesting problems as the slope was too steep for the trucks to haul to the top of the cut. A notched road with turn-outs was cut in the slope by the shovels so that the trucks could run forward to the shovels, back to the nearest turnout and turn around, and go forward down grade. Another wide notch runway was cut at the bottom of the slope so that the trucks could run in to place the toe fill.

Two Bucyrus-Erie 37-B gas shovels started at the east end of the job on March 24, only a few days after the Lorains began their work at the west end. Wherever a fill less than 3½ feet high was made, the top soil and brush were stripped and wasted. From 22 to 32 trucks were used for hauling on the job during the grading operations, with

an average of about 28 trucks.

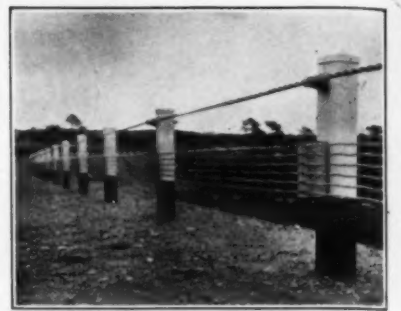
### Paving the Traveled Way

It is the universal practice in Massachusetts to place a gravel foundation course on the subgrade before any kind of paving is laid. This foundation course varies from nothing when the subgrade is all gravel up to 12 inches when there is some doubt as to the stability of the subgrade. On the Cape Cod Canal highway a 6-inch gravel foundation was spread and rolled before the 4-inch base course was spread.

The base course was a sand-bound stone varying from ¾-inch to 2¼-inch screen size (Mass. specification No. 1 and 2 stone) over which the sand was hand spread and hand swept during rolling by four 14-ton 3-wheel gas-powered Buffalo-Springfield rollers.

Upon completion of the 4-inch base course, a 2½-inch Penolithic top, a surface of the bituminous macadam type, was laid. The stone varied from 2¼-inch to 1¼-inch screen size with a maximum of 5 per cent of ¾-inch stone. The top stone was sprayed with 0.1-gallon per square yard of Penolithic oil after rolling, following which 1½ gallons per square yard of 51 to 60-penetration asphaltic cement was applied by the Standard Oil Co. of New York which hauled the asphalt from its tank cars spotted at Buzzards Bay, giving an average haul of about 4 miles.

Immediately following the application of the asphalt, a double crushed and screened chip stone of ⅝-inch



C. & E. M. Photo

A Section of the Multisafety Guard Rail Installation

screen size previously oiled at the crusher by spraying was applied with a Handy Sandy spreader at the rate of 22 pounds per square yard. Usually the rollers ran over the asphalt once before the chips were applied. The chips were touched up by hand immediately after application before they were rolled in with the 14-ton rollers. After the first rolling, a gang broom was hauled over the section by a truck. This broom consisted of 52 steel brooms set straight across the drag at the front and back and diagonally between. Rolling and brooming was continued through the second day after the asphalt was applied. Various combinations of brooming and longitudinal rolling were tried, but that described above was generally considered the most successful.

The final operation was the application of the seal coat, consisting of 0.4-gallon per square yard of the same asphaltic material as used before, covered with pre-oiled chips, as with the top course.

(Continued on page 44)

# Driving Rock Tunnel For Famous Highway

**Grade Change in Columbia River Highway Involves Construction of 827-Foot Tooth Rock Tunnel**

By HENRY W. YOUNG

(Photo on page 56)

COLUMBIA River Highway in the vicinity of Bonneville Dam contains a succession of stiff climbs and sharp descents together with shoulder-rounding curves. With the construction of the dam, it became necessary to change the grade of certain parts of the highway on the upstream side, and in so doing the grades are being reduced and many of the curves eliminated. There are, however, plenty of curves left in the hundreds of miles of this scenic highway for motorists to enjoy.

Tooth Rock is a pinnacle standing at the edge of what will be the reservoir, about a mile above the dam. The present highway climbs stiffly, and in sharp curves passes between the rock, near its peak, and the adjacent mountain. The new grade is approximately 50 feet below, and a tunnel is being driven there to pierce Tooth Rock.

### Preliminary Work

Tooth Rock tunnel will be 827 feet long and will have a 26-foot roadway and a 4-foot sidewalk on each side. The springline of the 17-foot radius arch is 4 feet 7 inches above the surface of the roadway. While the rock through which it is driven is not particularly difficult to handle, it presents some variations across the face. The latter is cut for a considerable portion of the length of the tunnel by a down-dipping stratum of basaltic rock, hard and tough but only

a few feet across. On one side of this is a variety of dice rock, which breaks into small pieces up to 4 or 5 inches through. On the other side, nearer the surface, the rock is well rotted and carries mud seams and pockets.

At both portals of the tunnel, the material is of such a nature as not to be self supporting, and it was necessary to timber in for some distance, about 60 feet at the west end and about 20 feet at the east end. In the latter case the problem was still further involved by the fact that the present road was directly above the entrance and would be undermined in facing up the portal. Therefore, a single-truss timber bridge 90 feet long had to be built to support the roadbed.

Nor was the timbering in the west end so easy, for they had to go inside and back out with it. Side drifts and top heading were first driven in the required distance and the arch ringed out and one set of timbers placed at the inward end. The ring was then taken out and all timber set before the center core of the bore was removed.

### Drilling and Blasting

When this preliminary work was done and the two faces driven into solid, self-supporting rock the tunnel was excavated in the usual way. A jumbo was built and mounted on a truck to be backed up to the face. On the heavy pipe frame of the jumbo, Ingersoll-Rand 174 water Leyners were mounted, six in number. The holes were drilled to a depth of 6 feet and loaded with Atlas Giant Special 40 per cent gelatin, fired by du Pont No. 1—No. 10 delay caps, at 220 volts off the line. From 65 to 80 holes were necessary at each drilling.

There was very little overbreak when

(Continued on page 28)



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## Farm-to-Market Program Not for Perpetual Relief

There is an increasing demand for a larger farm-to-market construction program throughout the United States, fostered by business organizations which see in such a program increased opportunities for over-the-counter sales to the rural population. Since this program to get the farmer out of the mud was started in Iowa about two decades ago, a tremendous mileage of improved secondary and feeder roads has been achieved. We have always maintained that a sane, continuing program to improve every secondary and feeder road is necessary to the economic and social welfare of both rural and urban America.

However, a serious potentiality has developed since the late-lamented depression. We now have in this country a politically-fostered population group which feels that it has a vested right in a government job if it can not, or will not, get any other job. These government jobs have carried the innocuous title "unemployment relief" and if the true meaning of the term had not been changed, by what our grammarians call "common usage," there would be no reason for fear, or for kicks on the part of the taxpayers. Unfortunately how-

ever, much of the so-called relief work has consisted of ill-conceived temporary improvements to secondary and feeder roads, classified by some highway engineers under the general term "manicuring."

The great danger in a huge farm-to-market program today is that the Congressional politician will use it as a gigantic "relief measure," with the result that these highway funds needed for an intelligent farm-to-market program will be spent by local and possibly incompetent officials to take care of the unemployed. The result will be hundreds of thousands of "made" road jobs but no new or improved rural service roads.

Let us have a well-conceived, well-managed practical farm-to-market construction program, supervised by state highway departments and under the direction of the U. S. Bureau of Public Roads, with the projects awarded to contractors employing men willing and able to work. This will be a capital investment of taxpayers' money, create additional business activity, increase private employment, and give to the country its needed network of all-year-round farm-to-market roads.

## A Dangerous Precedent

State Highway Commissioner Elsberg of Minnesota has found that his highway department revenues are \$6,675,000 short of the amount necessary to carry out even 60 per cent of the Minnesota construction program that would be possible under available Federal funds. In view of this situation, Commissioner Elsberg has set a dangerous precedent by recommending that efforts be made this year to match only 60 per cent of the allotted regular Federal-Aid funds and 75 per cent of the secondary and feeder road funds, or just what could be actually constructed during the coming season. It is his idea that the balance would be permitted to carry over to the following year.

If other states follow this plan a considerable portion of monies available from Washington will not be used for state highway construction this year. Thus state highway departments would be serving notice to Congress that it may

as well reduce the next Federal Aid appropriation and use this money for other purposes. At least that is the attitude that Congress is bound to take towards such a stand by the states.

What is actually the case is that states like Minnesota need additional revenue through an increased gas tax with every penny of the gas tax money being spent on the highways. It is hoped that the bill for a gas tax increase in Minnesota will be passed to enable that fine state to avail itself of full Federal Aid, and that other states which may be contemplating, through necessity, passing-up a portion of their Federal Aid monies will find the motorists' reaction against diversion even more effective so that state highway departments may make full use of the available Federal-Aid money, with the result that state highways and secondary and feeder roads may be built and maintained for the greatest benefit of all traffic.

## City of Moles Plans New Underwater Tunnel

New York City is not infrequently referred to as the "City of Moles" because it is possible to travel so far underground with only infrequent excursions into daylight. It is true that transportation has been greatly facilitated in New York City by its great subway system and the subaqueous tunnels connecting the Borough of Manhattan with New Jersey and Brooklyn.

On the last week day of February, Mayor LaGuardia announced the completion of plans for a twin-tube vehicular tunnel between the lower tip of Manhattan and Brooklyn. It is estimated by the engineers of the New

York City Tunnel Authority that the cost of the project would be about \$70,850,000. Tolls would be charged to make the tunnel self-liquidating. If it is possible to secure a Federal grant of \$30,000,000 to start work on the project, its construction is assured. On the other hand, if the Federal Government does not allot such a grant it is doubtful if the project can be entirely financed locally.

## Contractors' Honesty On PWA Contracts

Although PWA has done business with approximately 28,000 principal contractors and innumerable subcontractors, to date there have been only 29 convictions, affecting 34 persons who

## Federal Aid Available To Improve Feeder Roads

State highway departments are to select a system of secondary or feeder roads for improvement with Federal assistance, according to an announcement by the Secretary of Agriculture. Rules and regulations have been issued governing the expenditure of \$25,000,000 of Federal-Aid for secondary roads apportioned last December to the various states, Hawaii and Puerto Rico. The Federal funds which become available July 1 for payment to the state for completed work are to be administered by the U. S. Bureau of Public Roads in cooperation with the state highway departments.

The Federal funds must be matched by equal amounts of state funds, and are for expenditure on secondary highway construction projects initiated by the various state highway departments and approved by the Secretary of Agriculture.

The regulations define secondary or feeder roads as including farm-to-market roads, mine-to-market roads, rural free delivery roads, public school bus routes, and other important secondary roads. To qualify for this assistance each state must select a system of important secondary highways not to exceed 10 per cent of its highway mileage. The selection of roads to be included in this secondary highway system, the regulations provide, must be based on facts obtained from a highway planning survey in each state, and the Federal funds for secondary highways can be expended only on this system. Until such a system is designated, projects may be approved where it may reasonably be anticipated that the roads constructed will become part of the designated system.

The secondary highway systems will be essentially rural in character, although within municipalities sections linking important secondary highways with other main highways may be included. Highways now part of the Federal-Aid highway system or that are likely to be added to it can not be included in the secondary system to be improved under this appropriation.

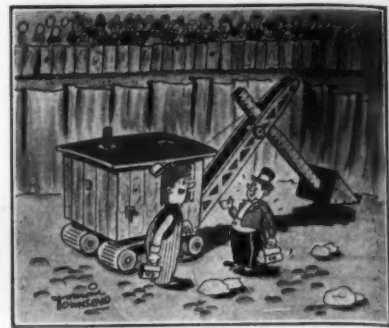
A wide distribution of benefits in each state is desired. To accomplish this, the Chief of the Bureau of Public Roads is authorized to determine the minimum percentage of counties in which the funds authorized for any one or more fiscal years shall be used, this percentage applying to each state.

All work done must be consistent with traffic needs. Grading and drainage as first-stage construction will be acceptable providing the state agrees to place surfacing or to improve the road bed later. The regulations specify that the states must maintain in satisfactory condition all roads improved with the Federal funds.

Highway planning surveys that will supply all information needed in selecting secondary road systems are well under way in forty states, and in many field work is nearing completion. These surveys are being made cooperatively by the state highway departments and the Bureau of Public Roads and are being financed largely with Federal funds.

Copies of the rules and regulations governing this secondary or feeder roads program may be secured from the American Road Builders' Association, National Press Building, Washington, D.C.

were either contractors or employees of contractors, for violations of the law, said PWA Administrator Harold L. Ickes in an address before the Associated General Contractors of America at their annual convention. Most of these convictions were for misclassification of labor and improper keeping of pay-roll records.



"I Quit Wearing Overalls. I Have My Public to Think Of!"

## Penalty of Diversion

Maryland is the first state to feel the effects of Section 12 of the Hayden-Cartwright Act, which invokes a penalty of as much as one-third of the regular Federal-Aid allotment when a state has diverted its gasoline taxes and motor revenues, according to a report from the American Road Builders' Association.

In notifying Maryland of the application of Section 12, the Bureau of Public Roads says:

"Our conclusion in the matter, therefore, is that there has been substantial diversion of the revenues derived from motor-vehicle license fees and gasoline taxes to other than highway purposes during each of the State fiscal years 1936 and 1937, within the meaning of Section 12 of the Hayden-Cartwright Act of June 18, 1934, and that as a result the State is subject to the deduction required by said Act from its apportionment of Federal-Aid funds. Since no finding to this effect was made during the Federal fiscal year which ended June 30, 1936, no deduction will be made from the State's apportionment for that year, but from the \$1,025,000 apportioned for the Federal fiscal year to end June 30, 1937, one-third or \$341,666.66 will be deducted. We, therefore, will proceed to deduct the above indicated amount from the apportionment to Maryland for the Federal fiscal year 1937, unless you can make an immediate showing satisfactory to us why such deduction should not be made."

Upon receiving this notification, Maryland made arrangements to restore her diverted funds to avoid this penalty.

Diversion in each of the states is being studied by the Bureau of Public Roads and just as quickly as the facts can be determined the penalties under Section 12 will be invoked. While definite figures as to diversion in 1936 are not yet available, it is estimated that \$200,000,000 was diverted from highway revenues and from the present trend that such misuse of highway funds will exceed \$300,000,000 in 1937.

It behooves every one interested in good roads to bring to the attention of the legislators and state officials of his own state the action that has been taken in Maryland's case, in order that every effort may be made to prevent the need of similar action being taken in other states.

## Report on Venezuela's Roads

The road mileage of Venezuela, by types of construction, are 2,771 miles of unimproved earth and non-surfaced road; 2,827 miles of improved earth, sand-clay and gravel types; 9 miles of bituminous concrete and asphalt; and 332 miles of cement concrete, totaling 5,939 miles of road, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

Road planning is under the authority of a Permanent Commission of Routes of Communication, Ministry of Public Works. No road building machinery is manufactured in Venezuela and practically all the equipment used is imported from the United States.

**Lubrication Manual Revised**

The "Alemite Industrial Lubrication Manual," a comprehensive reference manual on industrial lubrication, has been thoroughly revised and is now offered free to contractors and equipment maintenance men by the Alemite Division, Stewart-Warner Corp. In addition to listing Alemite lubricants, this book includes valuable data on where and when specific lubricants should be used, classified according to bearings, gears, etc., and also according to types of machinery. Included are several informative articles on such subjects as

the common causes of bearing failures, the lubrication of anti-friction bearings, and grooving bearings for high-pressure lubrication.

Readers of CONTRACTORS AND ENGINEERS MONTHLY may secure copies of this manual free by writing to the Stewart-Warner Corp., Alemite Div., 1850 Diversey Parkway, Chicago, Ill., on their firm stationery and mentioning this magazine.

Roadside plantings must be economically useful to be warranted and reduce, not increase, maintenance costs of the highway right-of-way.

**Park Heads New LeTourneau Promotional Engineering Dept.**

The organization of a promotional engineering department with Kenneth F. Park, formerly Assistant Eastern Sales Manager, in charge has been announced by R. G. LeTourneau, Inc., of Peoria, Ill., and Stockton, Calif. This department, through visits of its staff to earth-moving projects throughout the United States, will accumulate and maintain for the benefit of contractors and engineers an up-to-date fund of data on construction practices. The services

of its engineers are available on request for estimating earth-moving on proposed projects. Another duty of the department will be the development of new applications for LeTourneau equipment.

Mr. Park, who has had 20 years of actual field experience as foreman, superintendent and engineer on earth-fill dam, highway, levee, canal and other construction, has been responsible for the LeTourneau time studies, job action photographs and project data which this company has furnished to contractors and distributors for the preparation of estimates during the past 8 years.

# HUSKY FRONT ENDS for Tough Digging

HERE IS THE BUSINESS END  
OF A NORTHWEST  
MODEL 15- $\frac{3}{8}$  YD.  
SHOVEL

*Suggested*  
IS  
WRITTEN  
ALL OVER IT

The boom—welded and designed to overcome digging conditions far harder than the ordinary small shovel can meet. (Remember no Northwest welded boom has ever failed).

The stick is welded—and the full  $\frac{3}{4}$  yd. struck measure dipper has a manganese front.

Behind this is the Northwest Independent Crowd—the crowd that utilizes power other shovels waste! This design is characteristic of all Northwests. They have the toughest front ends on any shovel, size for size. Altogether they are the finest pieces of equipment of their type and capacity on the market today—and we can prove it!

NORTHWEST ENGINEERING COMPANY  
1730 Steger Building Chicago, Illinois  
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GASOLINE  
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DIESEL  
OIL

Built  
in a range  
of 18 SIZES  
 $\frac{3}{8}$  yd. capacity  
and  
Larger

# NORTHWEST

SHOVEL • CRANE • DRAGLINE • TRUCK SHOVEL • TRUCK CRANE



The Completed Bridge, Showing the Crib Type of Construction with Granite Slabs

## Novel Bridge Built at Casco Bay, Maine

**Bailey Island Bridge Has Been Completed After Sixty Years of Discussion; Granite Slabs Laid as Continuous Crib**

By ALFRED ELDEN

ONE of the most interesting bridges in the country, and surely one of the most unusual, is found at Casco Bay, Maine, connecting Bailey and Orrs Islands. The bridge was built only after a discussion that lasted fully 60 years. With the completion of this bridge a motorist leaving Brunswick on the mainland crosses a series of bridge-connected islands, carrying him far out into the open ocean.

Bailey Island is one of the most beautiful in Casco Bay and it has a fairly large population of fishermen the year around. During the warm months the population is augmented by a large summer colony living in cottages and hotels. Before the Bailey Island bridge was built it was necessary to cross the tortuous Wills Strait between Bailey and Orrs Islands in a small boat. Winds and tides made it a rough trip always, while in winter drift-ice piled in and frequently made it impossible.

### Bridge Construction

The type of construction for the bridge was important because of the force of the tides through the narrow passage and because of the battering of the ice. The final plans were copied from a bridge in Scotland which was constructed across a long stretch of salt

marsh where the tidal problem was somewhat similar. Fortune favored the builders of the Casco Bay Bridge in that outcropping ledges formed a natural foundation much of the way across the 1,200-foot strait. Half way across, however, there is a narrow deep water channel which had to be spanned.

The causeways to the single iron span, which rests on solid concrete

piers, were made by laying granite slabs in crib or open construction on the ledge bottom. The rushing tides pass through this crib-like structure without difficulty. No mortar was used in laying the granite slabs. The single span over the deep water channel is 52 feet long. The roadway across the bridge is of reinforced concrete.

The granite slabs came from the Carleton Quarries at Pownal, Me., which delivered 10,000 tons. The roadway slab required 1,350 tons of concrete and is 22 feet wide for the entire length. The bridge, with its approaches, is 1,500 feet in length.

### New P & H Distributor

The Harnischfeger Corp., of Milwaukee, Wis., has announced the appointment of R. D. Jenkins & Sons, 202 E. Second St., Reno, Nevada, as exclusive distributor for P & H excavators and welders in the western section of Nevada. This company will work in conjunction with the San Francisco office.

## All-Welded Carts For Handling Concrete

Slusser-McLean two-wheel concrete carts, manufactured by the Slusser-McLean Scraper Co., 248 Poplar St., Sidney, Ohio, are electrically welded throughout and therefore have no rivets, bolt heads or nuts protruding inside the body. The bowls are heavily reinforced around the top and the balance is designed for easy handling.

These carts are made in two sizes, 6 and 11 cubic feet, with steel wheels or with pneumatic-tired wheels. The 6-cubic foot carts are available with 36 or 42-inch steel wheels or with 30 x 3 1/2-inch pneumatic tires and the larger size also is equipped with 30 x 3 1/2-inch pneumatic tires.

Literature describing these concrete carts, as well as the steel-wheel and pneumatic-tired wheelbarrows, scrapers, backfillers and rooters made by this company, may be secured direct from the Slusser-McLean Scraper Co.

## Good Engineering and Good Products Make Good Roads



Socony R. C. 3 Road Mix, Standard Brand, Washington County at Fort Ann, N. Y.

Socony Asphalt Road Oils • Socony Asphalt Joint Fillers • Socony Waterproofing Asphalt • Socony Cut-Back Surfacing Asphalt • Socony Asphalt Binder A for surface treatment • Socony Refined Asphalt for sheet asphalt paving • Socony Cold Patch Asphalt for all types of patching • Socony Asphalt Binders B & C for penetration work (Asphalt Macadam) • Socony Paving Asphalt 51-60 and 61-70 Penetration for the mixing method (Asphaltic Concrete) • Specifications and all other particulars furnished on request.



**SOCONY-VACUUM OIL CO.**  
INCORPORATED  
STANDARD OIL OF NEW YORK DIVISION



for concreting those "hard to get at" places—

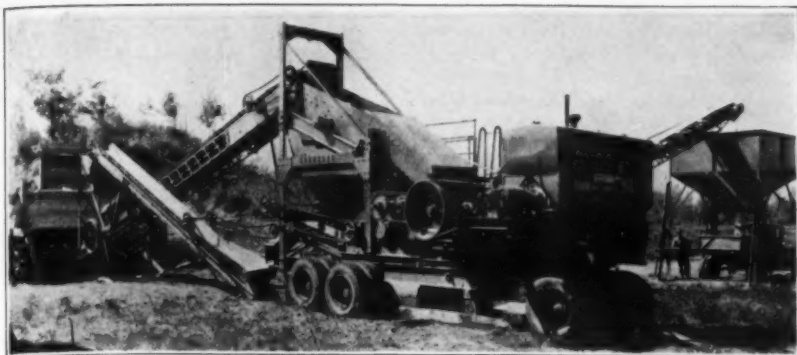
such as tunnels, subways, sewers, etc., RANSOME Pneumatic Placers and Grouters are the most economical and efficient methods and equipment obtainable.

Their performance records on many difficult jobs have definitely proved their superiority from every angle.

Write for detailed information TODAY.

**RANSOME CONCRETE MACHINERY CO.**  
Dunellen, New Jersey





The New Universal Dual Gravel Crushing, Screening and Loading Plant

### New Dual Gravel Crushing, Screening, Loading Plant

A new Universal dual gravel plant, made for handling 100 to 200 tons an hour and over, has been announced by the Universal Crusher Co., Cedar Rapids, Iowa. The manufacturer claims high efficiency and low-cost operation for this compact plant which contains a No. 936 Universal jaw crusher, a 30 x 16-inch roll crusher, a 4 x 8-foot double-deck gyrating screen, and a sand rejector. The entire assembly is mounted on a heavy-duty goose-neck-type six-wheel truck with twelve pneumatic tires. A 53-foot x 24-inch feeder belt conveyor, a 52-foot x 18-inch delivery belt conveyor and a 21-yard steel jack-leg bin complete the assembly.

Other Universal plants, in models to suit varying operating conditions, are also available in both portable and stationary types.

### New Diamond Drill For Deep Holes

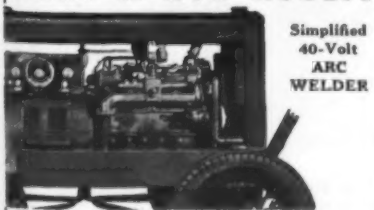
The new Coroc diamond drill, recently announced by the Ingersoll-Rand Co., 11 Broadway, New York City, is equipped with a master gage which registers directly in pounds the pressure of the diamond bit against the rock. Thus, when a soft formation or seam is encountered during drilling, an immediate reaction is indicated on the gage.

The hydraulic control mechanism permits the drill, under such conditions, to accelerate its feed, but does not allow the string of tools to drop. The Coroc drill can be operated by gasoline or kerosene engine or electric motor drive. Hoisting of the tools is facilitated by an integral hoist particularly suited to this type of work.

Holes to 1,150 feet, producing cores  $\frac{3}{8}$ -inch in diameter, or shorter holes with larger cores up to 3 inches in diameter, are possible. The hydraulic feed has a 12-inch travel and the drill head may be swiveled 360 degrees.

Bulletin No. 2231 which describes and illustrates this new Coroc diamond drill may be secured free direct from the manufacturer by mentioning this magazine.

### RENT A New Hobart



Simplified 40-Volt ARC WELDER

Save hundreds of dollars monthly repairing your own equipment right on the job. No labor lost, no delay. Build forms—use new steel construction with Simplified easier welding.

#### FREE . . .

- Book on "The Many Profitable Uses of Simplified Arc Welding."
- Book on "Carbon Arc Welding and Cutting."
- Book on "Building Your Own Arc Welder Saving \$300 to \$500."

HOBART BROS., Box CE-47, TROY, OHIO

### Wood Sole Paver's Sandals Protect Feet and Paving

To leave footprints in the sands of time may be very admirable, but footprints on freshly-raked asphalt pavement is quite another matter. The Davenport wood sole paver's sandal,

made by the F. J. Stahmer Shoe Co., Davenport, Iowa, is designed to keep the feet of the laborers off the paving when raking asphalt, thus eliminating the necessity of going over the surface to remove footprints, as well as to prevent the hot asphalt from burning the men's feet.

The sole of these sandals is of well-seasoned soft maple. The top of the sole is cut with a recess for the heel, while the sole part is cut with the proper contour to fit the sole of a regular work shoe. The counter is of heavy galvanized iron, attached to the heel part with long galvanized nails, and is provided with a buckled supporting and lacing strap. This strap is drawn through a strap nailed to the toe end of the sole, which strap is connected to a wide strap extending over the foot and nailed to both sides of the wood sole, holding the sandal firmly and comfortably in place over a regular shoe. Prongs or spikes, of drop-forged steel, 3 inches high and drawn to a point  $\frac{1}{4}$ -inch square, are securely fastened to the

flat bottom of the wood sole with two large-headed counter-sunk bolts and lock washers. These spikes support the worker and leave no hard compacted spots as when ordinary shoes are worn.

Further details and prices on these sandals as well as on the other safety shoes made by this company may be secured by writing direct to the manufacturer and mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### GRIFFIN WELLPOINT SYSTEMS

Distributors In

70

Principal Cities

GRIFFIN WELLPOINT CORP.

725 East 140th St., New York

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**AVERAGES 800 YDS. DAILY FOR 4 MONTHS WITH  $\frac{3}{4}$  YD. LORAIN-40**



### AN OUTSTANDING DRAGLINE

★ **BECAUSE**—It has stability and capacity to handle a  $\frac{3}{4}$  yd. bucket with speed and efficiency, at practically  $\frac{1}{2}$  yd. weight and costs.

★ **BECAUSE**—It has low ground pressures. Its minimum weight is supported by a long, wide crawler; built with power and agility for tough, cross country travel. Two speeds are available. Crawler steers in either direction, regardless of the turntable position.

★ **BECAUSE**—It has a cable-saving fairlead (patents applied for) made with interlocking or geared sheaves that greatly extend drag cable life.

★ **BECAUSE**—These features enable L-40's to make records like this.

Send for the "Performance is Convincing" Booklet.  
It gives similar data on 20 different jobs.

THE UNIVERSAL CRANE CO., LORAIN, OHIO

# LORAINS

### THE RECORD

Unit:  $\frac{3}{4}$  yd. Lorain-40.

Owner: Miller Gravel Co., Otisville, Mich.

Job: Stripping and loading gravel in pit.

Length of Boom: 40 ft.

Operating Radius: 25 ft.

Depth worked below treads: 25 ft.

Bucket:  $\frac{3}{4}$  yd., heavy Page.

Hours worked per day: 10 hours.

Aver. daily yardage: 800 yards\*\*

\* Miller Gravel Co. now owns 2 Lorain-40's.  
\*\* Based on 4 months operation, 10 hrs. daily.

LORAINS • 2 to  $\frac{3}{8}$  yd.

# Huge Irrigation and Power Project in Central Wyo.

## Casper-Alcova Project Has Wide Variety of Activity, Including Initial Tunnel, Dams and Canals

(Photo on page 56)

**M**EN and machines are now engaged in the task of harnessing the North Platte River in Wyoming in order to put it to work at irrigation and power development. The Casper-Alcova project, started several years ago with the construction of a diversion tunnel, will cost approximately \$20,000,000 and will be completed in 1940. Located in Natrona and Carbon Counties, Wyoming, it involves the construction of Seminoe Dam, reservoir and power plant, Alcova Dam, the main irrigation canal and the necessary laterals. The Seminoe Dam and reservoir will provide storage, river regulation and power. A few miles downstream, the Pathfinder reservoir, completed in 1908, will serve to redistribute the outflow of the Seminoe reservoir. Alcova Dam is part of the irrigation plan and is being constructed across the mouth of Alcova Canyon about 30 miles southwest of Casper. The Casper Canal which will divert water from the Alcova reservoir, extends a distance of 60 miles to Middle Casper Creek, to irrigate 35,000 acres in the first unit, lying mainly west and north of Casper.

### Diversion Tunnel

Work on the Alcova dam site started in 1933 with the construction of the 20-foot concrete-lined diversion tunnel through the east side of Alcova Canyon wall. The contract for this tunnel, which is 1,380 feet long and included a 33 x 60 x 60-foot valve chamber and a 14 x 16-foot elevator shaft 169 feet long, was completed by the Lawlor-Woodward Co., of Seattle, Wash., at a contract price of \$467,927.

### Alcova Dam

Alcova Dam will be of the earth-fill type, located across the mouth of Alcova Canyon, with a crest length of 900 feet and a height of 181 feet above the river bed. The upstream slope is protected by heavy rock riprap and the downstream portion is a freely draining mixture of rock fragments and boulders. Before construction began, a large number of hot springs discharged, at low river level and below, an amount of

water which probably totaled about 20 cubic feet per second at the dam site.

The portion of the dam site upon which the impervious section of the dam is being constructed was stripped of gravel and boulders to bed rock, a maximum distance of 86 feet below low water level in the river. During stripping operations, 64,000 linear feet of grout holes were drilled and 211,000 cubic feet of grout forced into the crevices, cutting off the inflow and providing a practically dry foundation upon which to place the impervious section of mixed earth and gravel.

Cut-off walls, a collection gallery and tunnels have been completed under the



Part of George W. Condon's Fleet of A-C Speed-Aces. These Units Operate 21 Hours a Day, Making 40 Round Trips Each 7-Hour Shift.

impervious section and the operating house at the top of the diversion tunnel shaft has also been completed. Work is now underway on the spillway and the rock fill section of the dam.

W. E. Callahan Construction Co., of St. Louis, Mo., and Gunther & Shirley of Dallas, Texas, who received the contract for the Alcova Dam for \$1,482,561, exclusive of materials, sublet the

placing of the earth fill to George W. Condon Co., of Omaha, Nebr. It is estimated that 1,200,000 yards of dirt will be placed to make the dam one of the largest of its type ever constructed.

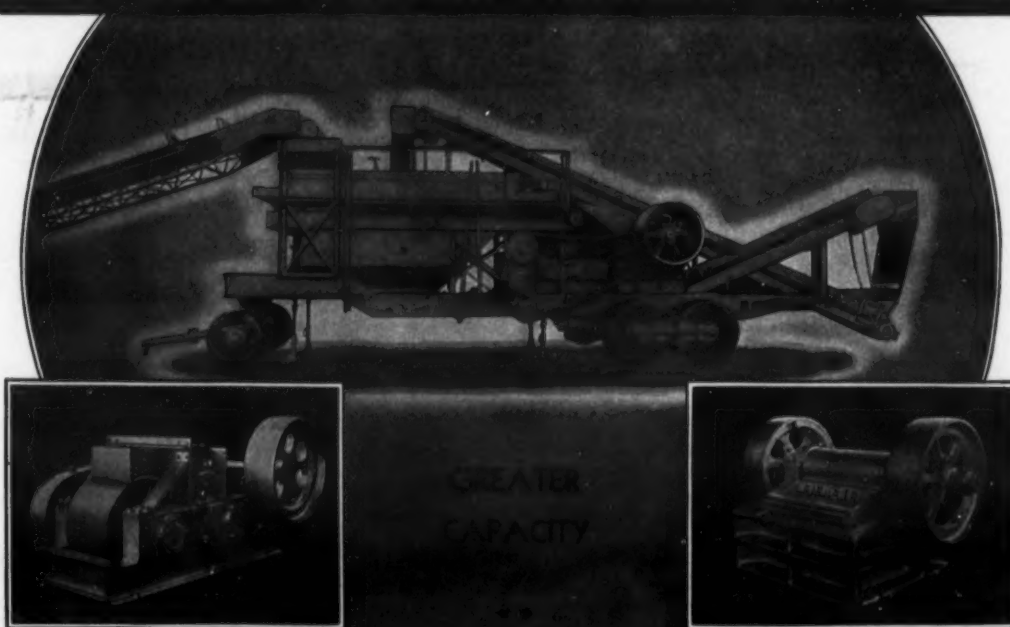
Since suitable material for the earth fill could be obtained only at distances varying from three-quarters to one mile, hauling was somewhat of a problem. A

(Continued on page 22)

## THE HEART OF

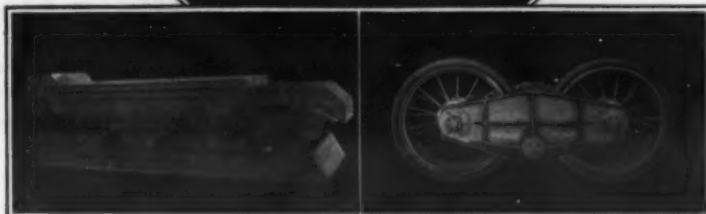
## Profitable Aggregate Production

### IOWA SUPER-TANDEM STRAIGHT LINE PLANTS



**Yes Sir! The HEART of Profitable Aggregate Production is your crushing and screening plant. Insure your profits with an Iowa Plant.**

**USE THE BEST. Join the Profitmakers of 1937. Use Iowa Straight Line Plants, acknowledged as the standard throughout the aggregate producing field.**



**ADAPTABLE TO EVERY JOB -- a variety of sizes -- with or without large primary crusher -- solid or pneumatic tires or plain steel wheels -- walking beam -- with or without power, sand eliminator, straight or swivel feed conveyor, truck or bin loading delivery conveyor.**

Tell us your production problems and we will tell you how to save money.

Write for the Straight Line Plant bulletin.

## CONCRETE VIBRATORS

Air operated vibrators for all classes of concrete construction including bridge deck slabs, dams and locks.

Portable Vibrating Screed Boards for highway pavements.

Special steam operated vibrators for placing hot asphalt mixtures.

Write for circulars and engineering data

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**MUNSELL CONCRETE VIBRATORS**

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IOWA MANUFACTURING COMPANY

CEDAR RAPIDS, IOWA, U. S. A.



### New Bronze Alloy For Water Valves

Among the new applications for bronze of interest to contractors are the manganese bronze tunnel liners and gate guides and Koppers D-H-S bronze gate seals and gate seats required in emergency gate tunnels and shafts for Fort Peck Dam tunnels, Fort Peck, Montana. The U. S. Army Engineer Corps, which drew up the specifications for these

bronze alloys, decided to use bronze when it was found that any additional costs would be wiped out in a few years by the elimination of costly and troublesome up-keep of underground metal construction.

This entirely new utilization of bronze was made possible by a new bronze alloy with higher physical properties, a development of the Koppers Co.'s Bartlett-Hayward Division in Baltimore, Md. Other economies made

possible by a bronze alloy of such high ductility, hardness and strength open many more avenues of use where replacement and up-keep are serious factors for consideration.

### Bucyrus-Erie Appoints Two New Distributors

Announcement has been made by the Bucyrus-Erie Co., South Milwaukee, Wis., of the appointment of the firm of

Ginsberg & Horan, 355 Walton Ave., New York City, as its distributor for Bucyrus-Erie excavating equipment in the New York Metropolitan area. They will carry an adequate supply of repair parts and the smaller sizes of shovels at their warehouse.

Another new distributor for this company is the Abrams-Anderson Co., 10425 Northlawn Ave., Detroit, Mich., which will represent the Bucyrus-Erie Co. in southern Michigan.

**OWNERS  
WILL TELL YOU\***

## ADAMS SETS THE PACE IN BLADE OPERATION

A grader's value to you depends upon what you can do with it. Owners of the new-type Adams Leaning Wheel Graders will tell you that these machines do better work than others, and much more work per dollar of operating cost for three very distinct reasons. First, a wide range of blade adjustments enables them to make cuts impossible with other graders; second, adjustments are made so quickly and easily (blade can be lifted from ditch position to high bank cutting position in 40 seconds) and, third, the new design permits the operator to see exactly what he is doing at all times. All of these advantages result in much time saved and more work done.

Before buying your next grader, have our local representative show you one of these remarkable machines, or write for complete details.

**J. D. ADAMS COMPANY • Indianapolis, Indiana**  
*Branches, Representatives & Distributors throughout United States*

### \*HERE'S WHAT THEY SAY—

"I like the many different angles at which the moldboard can be set and the rigidity of the blade at all angles." . . . *Contractor, Minnesota.*

• • •

"Have not found a position that we cannot put the blade in." . . . *Contractor, Indiana.*

• • •

"Can do faster, better and more accurate work because of the wider range of blade adjustments." . . . *Contractor, Florida.*

• • •

"Can reach farther out from the line of pull." . . . *County Supt., Illinois.*

• • •

"Can slope banks in one-third the time and do a much better job." . . . *County Supt., Miss.*

**ADAMS\***

**\*GRADERS**

### Galvin New Sales Manager Of Caterpillar Tractor Co.

E. R. Galvin, one of the most widely known men in the tractor industry and in industrial sales circles generally, was appointed General Sales Manager of Caterpillar Tractor Co., effective March 1. Formerly General Sales Manager of Cleveland Tractor Co., he became a District Representative for Caterpillar in 1928. Shortly thereafter he became Sales Manager in charge of the Eastern Sales Division with headquarters at Peoria. In January, 1936, he was appointed Assistant General Sales Man-

ager, from which position the new appointment is a further step of advancement.

### Soil Testing Instruments

A new booklet "Soil Testing Instruments and Apparatus" has recently been announced by the American Instrument Co., Inc., Silver Spring, Md. This booklet contains data on the mechanical analysis of soils, with an accompanying flow sheet, and descriptions and illustrations of the instruments and apparatus required for making soil tests. Copies of this booklet are available

gratis to contractors and state and county highway engineers by writing to the American Instrument Co., and mentioning **CONTRACTORS AND ENGINEERS MONTHLY**.

### New Road Building Handbook

A new 70-page handbook, containing complete tables and useful general information on the use of Tarmac for road construction and maintenance, has just been issued by the Koppers Co.'s Tar & Chemical Division. The book also contains a discussion

of methods and advantages of soil stabilization with Tarmac, condensed specifications for various methods of using road tars, and tables of data not previously issued in handbook form. There is also a list of other Koppers products for the highway and public works field, including crack filler, paving pitch, traffic marking paint, waterproofing material, weed killers, treated timber and welded and riveted pipe.

Copies of this handbook may be secured free by writing to the Tar & Chemical Division, Koppers Co., Koppers Bldg., Pittsburgh, Pa., and mentioning this magazine.



## PAVEMENT 9 INCHES THICK .... ripped to smithereens

When Crowe Brothers took the job of building an underpass under the Union Pacific Railway in Los Angeles, they had to move a pavement of tough asphalt and crushed rock mix, 9 inches thick—a mean job any way you look at it. Long-time LeTourneau users, Crowe Brothers put a LeTourneau Rooter on the job, with it ripped the pavement into chunks, moved those chunks out of the way with

LeTourneau Carryalls. Thus LeTourneau Rooters again job-proved that they can rip up tough materials profitably and make scraper operation possible at costs which eliminate much of the excavating and hauling equipment once thought necessary for the handling of macadam, sandstone, hardpan, cemented gravel, and like materials. When you meet such conditions, ask your "Caterpillar" tractor dealer to show you what a LeTourneau Rooter can do for you.

Ask your "Caterpillar" dealer for a demonstration

# LETOURNEAU

**R. G. LeTOURNEAU, INC., Stockton, California, Peoria, Illinois, Cable Address "Bobletorno"**

Manufacturers of: Angledozer, \* Buggies, \* Bulldozers, Carryall \* Scrapers, Cranes, Drag Scrapers, Power Control Units, Rooters, \* Semi-Trailers

\*Name registered U. S. Patent Office.

# Nevada Materials Lab. Controls Road Work

## New Laboratory Building Of Dept. of Highways Makes Possible Accurate Control of Materials

IN order to provide facilities for obtaining precise and complete data on all materials entering into the construction of highways in the State of Nevada, the Nevada Department of Highways put into service last fall its new Materials Research Laboratory. The new unit replaces and augments the former testing rooms located in the basement of the headquarters building and makes for greater efficiency and economy in the operation of one of the most important branches of the department's work.

Before a road is constructed anywhere in the state, it is necessary for the department to know the chemical constituents of the soils along the proposed right-of-way, their moisture content or moisture absorption qualities, and whether harmful ingredients are present in excessive amounts which would accelerate deterioration of road-way sub-base materials. After analyses and tests of numerous soil samples are made, the specifications are made up, based on the results of the tests. After the specifications are drawn, additional analytical tests of various materials to be used are made and checked, including such tests as determining the strength and resistance qualities of concrete or steel, or any other material used in the construction of roads, bridges and grade separation structures. All asphaltic surfacing materials are tested and unless the samples of all materials submitted for acceptance meet the standard requirements set up by the Department as well as by the U. S. Bureau of Public Roads, the materials are rejected.

In short, the Materials Research Laboratory provides the Department of Highways with a measuring stick by which the State of Nevada may be sure it gets what it pays for in quality of road materials and construction.

### The New Building

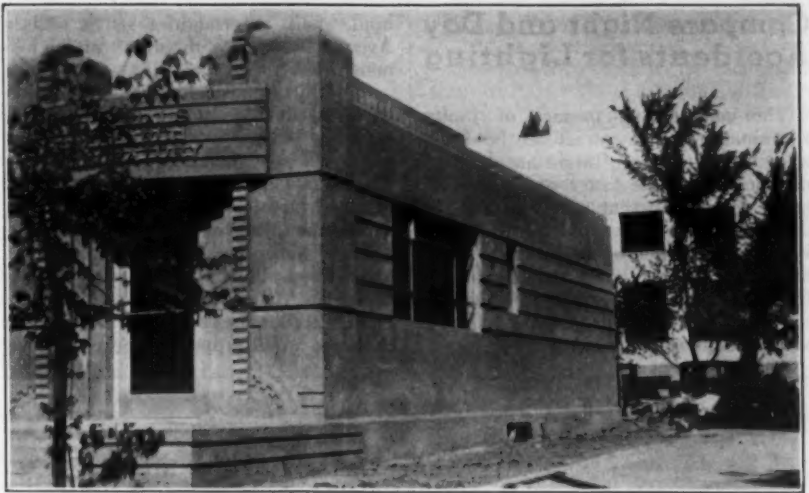
The new structure, erected next to the Department headquarters, is a single-story monolithic concrete building, of modern design, 70 by 40 feet in dimension, and is both fire and earthquake-proof. A special feature of the floor

plan consists of a separate shock-proof foundation for a room which contains the delicate weighing instruments. Set between the main floor foundation and this "Lab Cell" is a 1/2-inch sponge rubber insulator to absorb any shock or vibration. A concrete and steel vault occupies the northeast corner space and is used for storing departmental records.

State funds for the construction of the building were supplemented by a grant of ERA money and work was carried on under PWA supervision. The total cost of the building was \$38,000.

### Equipment

Among the instruments and testing apparatus installed in the new laboratory is a modern 200,000-pound capacity Olsen Universal testing machine

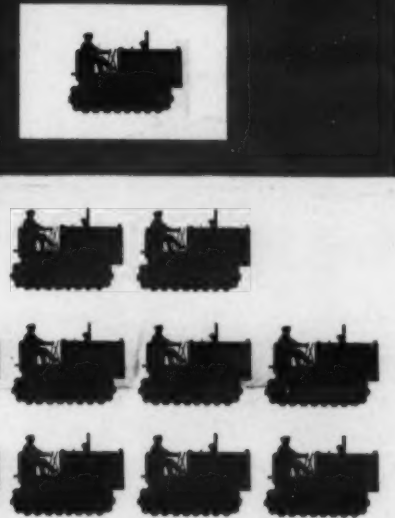


The New Materials Research Laboratory of the Nevada Department of Highways, Showing the New State Supreme Court and Library Building At the Rear

for determining the tensile and compressive strength of steel which will be used in the construction of bridges,

grade separation structures or reinforced concrete walls on highway projects, and  
(Continued on page 29)

Multiply Diesel  
Service Hours by **TEN**  
with **SINCLAIR**  
**TEN-OL**



How would you like to get ten times more service hours between shutdowns with your "Caterpillar" Diesel? You can if you use Sinclair Ten-ol, the new alloyed lubricating oil developed by Sinclair.

In full power comparative laboratory tests using "Caterpillar" Diesels, Sinclair Ten-ol was compared to the finest straight mineral oil. Ten-ol gave ten times more service hours without shutdown than the high

grade straight mineral oil. In the average of all tests, consumption of Ten-ol was approximately one-half that of high grade straight mineral oils.

Sinclair Ten-ol is recommended by the Caterpillar Tractor Company as a "new outstanding Diesel engine lubricant." Order Sinclair Ten-ol, Sinclair Diesel fuel and other Sinclair products from the local Sinclair office or write to Sinclair Refining Company (Inc.), 630 Fifth Avenue, New York City.

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**THE STRONGEST  
GEARED  
POWER  
FOR ITS  
WEIGHT  
IN THE  
WORLD**

**BEEBE BROS.**  
ALL STEEL HAND HOIST

SEATTLE, U.S.A.

**COMPACT—POWERFUL—SAFE**  
"For use where power is not practical or available"

Manufactured in 2, 5 and 15-Ton Sizes.  
For capacity comparison, 1/2" cable used:

2-Ton "Lightweight"	75 ft.
5-Ton "General Utility"	250 ft.
15-Ton Triple-Geared "Special"	1300 ft.

Patent instant gear change and positive internal brake that never fails, and will lock load.

Gear Ratios	Weight	Price
2-Ton 4 & 22 to 1	60 lb.	\$50
5-Ton 4 & 24 to 1	110 lb.	\$75
15-Ton 4, 19 & 100 to 1	600 lb.	\$200

**BEEBE BROS.**  
2724 6th Ave., So., SEATTLE, WASH.  
Warehouse stocks for dealers' supply; Seattle—Chicago—Brooklyn—Houston. Complete Literature and List of Dealers in Principal U. S. Cities and Foreign Countries Gladly Mailed.

### Compare Night and Day Accidents for Lighting

The contributing menace of faulty illumination on any street can be determined by the ratio of night accidents to day accidents, the latter serving as an index of the inherent traffic hazards of the street, according to Kirk M. Reid, Lighting Engineer of the General Electric incandescent lamp department in Cleveland.

For an example of this, he referred to the accident records on three Cleve-

land main thoroughfares, St. Clair Avenue N.E., E. 55th Street, and Kinsman Road S.E.

"Of thirty-one traffic fatalities which occurred during 1936 on these inadequately lighted streets, twenty-seven happened at night and only four in the daytime. On the average then, these thoroughfares are seven times more dangerous to travel at night," Mr. Reid pointed out. "In fact, the hazard at night on a vehicle-mile basis is really about 21 times that by day, because there is three times as much traffic in the daytime. While there is more careless

driving, more fatigue, and more drinking at night, experience in Cleveland, Detroit and other cities has shown that any abnormal proportion of night accidents is largely attributable to inadequate illumination."

On a 6-mile stretch on St. Clair Avenue, fourteen fatal accidents were recorded last year, twelve of them at night. On a 3.8-mile section of E. 55th Street, twelve persons were killed, eleven of them during darkness. Five fatal accidents occurred on a 2-mile stretch of Kinsman Road S.E., four of them at night.

### Soil Fundamentals In Elementary Form

In a 60-page pamphlet the University of Oklahoma Press offers a well-prepared introduction to soil mechanics under the title "Elementary Soil Fundamentals" by H. S. Gillette. Well-conceived diagrams and charts help greatly in illuminating the theory and procedure discussed in the text. Copies of the pamphlet may be secured for 65 cents each from the University of Oklahoma Press, Norman, Okla.

# THE SAME RELIABLE

#### MAKING THE CUT

Here's a dirt-moving team for low costs and big yardage: a "Caterpillar" Diesel-powered Lorain 77 Shovel loading into Athey track-type wagons pulled by "Caterpillar" Diesel RDS Tractors. The photograph shows highway relocation near Paterson, N. J.

#### FINISHING THE BANK

Rugged construction—accurate control—quick adjusting—these are reasons why this "Caterpillar" combination of Diesel Tractor and power-controlled grader is first choice. Photo taken on road construction in Illinois.

# CATERPILLAR

REG. U.S. PAT. OFF.

## TRACTOR CO., PEORIA, ILLINOIS

## How Blasting Cap Accidents Occur

In a study of blasting cap accidents made by the Institute of Makers of Explosives, it was found that in practically every accident, a child or children has found blasting caps lying about in the road, in a field, quarry, shed or even in the home where unexploded caps had been brought by those who had been using them.

It was clearly evident that the caps had been left lying about by careless

adults, although in some rare cases it was found that boys had stolen them from a quarry shed. Most of the accidents occur in rural communities and in small towns near which blasting takes place in quarries, along a new road location, or in mines.

A summary of how the children disposed of the blasting caps, thus causing accidents, showed that 23 per cent of the accidents were caused by throwing them in the fire or lighting them with a match, 11 per cent of the accidents were caused by picking with a pin, knife or nail, 19 per cent by hammering,

6 per cent miscellaneous causes, and 41 per cent by causes unknown.

Blasting caps are absolutely necessary with the use of high explosives in quarries, highway construction and various other types of construction. There seems to be little excuse, however, for the carelessness of many of the people handling them in leaving them about where they are accessible to children. During 1936 a decrease of 9.4 per cent in blasting cap accidents to children 16 years of age and under was effected and it is to be hoped that 1937 will see a much larger decrease.

## Road Work in Nova Scotia

The Province of Nova Scotia Department of Highways is planning 305 miles of hot-mix penetration paving in 1937 and about 142 miles of paving in 1938, according to a report from the U. S. Bureau of Foreign and Domestic Commerce. The Department also proposes to purchase more diesel road maintainers. A new program for reconstruction and paving on other main highways and tributary roads will be drawn up for 1938. It is expected that a larger sum for maintenance will be released soon.

# POWER FOR THE

# Whole Job

FROM the clearing of the right of way straight through to the finishing work, "Caterpillar" Diesel equipment today is standard for low costs and for keeping the job on schedule. The same reliable, heavy-duty engine powers tractors, road machinery and digging equipment—it's the same engine that 83 leading manufacturers have chosen to power their products.

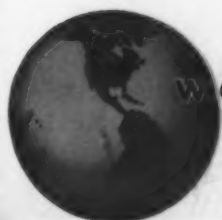
Ask a dealer to show you the operating figures on the "Caterpillar" Diesels that have already hung up 15,000, 20,000 or more hours of work—and are still making records.

### CRUSHING GRAVEL

Cheap power: "Caterpillar" Diesel Engines operate continuously and efficiently on low-cost fuel—here's one crushing gravel on 17 cents' worth of Diesel fuel per hour for the Stevens Pass Highway job in northern Washington.

### SPREADING THE MIX

It takes lugging power and traction to work oil-mix... that's why the A. H. Read Construction Co. use a fleet of "Caterpillar" Diesel Auto Patrols on their job near Laramie, Wyoming. Fuel consumption for this work is less than 2½ gallons of low-cost Diesel fuel per hour—and maintenance costs are equally low.



WORLD'S LARGEST MANUFACTURER OF DIESEL ENGINES,  
TRACK-TYPE TRACTORS AND ROAD MACHINERY

## Pair of Road-Mix Units Have Same Frame and Gear

Recently on a tar stabilization job near Waukon, Iowa, Paul Graham, contractor, of Des Moines, Iowa, built 12 miles of road using a medium tar both for priming and for mixing the top. This job consisted of crushed rock under  $\frac{3}{4}$ -inch size with an addition of 30 per cent fine sand. This was laid down on the prepared surface at the rate of 1,350 tons to the mile. The material was processed with a Parsons Turbo Retread, dry mixing the 70 per cent crushed gravel and 30 per cent sand to a uniform mixture. The tar was added at approximately 12,000 gallons to the mile, mixed, windrowed, and laid down with a Parsons Retread machine. There was only one auto patrol blade on the job which went along at as high a rate as 4 miles per week. A 60-hp crawler tractor was used to operate the Parsons machine.

The standard Parsons Turbo, made by The Parsons Company, Newton, Iowa, has been in use now for three seasons and machines have been operated in 12 states from Oregon to West Virginia under practically all conditions of mixed-in-place work. Crushed rock on several roads in the Oregon mountains was mixed and laid 18 feet wide with 1,200 yards to the mile. In Nebraska reverse conditions were found where fine blow sand was mixed at the rate of 1,000 yards to the mile requiring as high as 24,000 gallons of cutback asphalt per mile. Still different conditions were met in Montana and Michigan where pit-run gravel with the oversize taken out was successfully handled with the Parsons Turbo. In West Virginia fine crushed rock used at the rate of less than 500 cubic yards to the mile was mixed with cutback asphalt and heavy road oils.

For cement stabilization the Turbo has handled mixtures up to 12 inches deep consisting of gravel and clay in the proportion of 80 to 20 and with an addition of 10 per cent of cement. This is believed to be the maximum depth handled by any machine in this type of work.

The Parsons Turbo Retread and the Parsons standard Turbo mixer are made on the same frame and running gear. The Turbo Mixer is for mixing only. The Parsons Retread was designed, at the suggestion of the Bureau of Public Roads, to make it possible to use the Turbo Mixer to windrow, spread and edge the material. This service applies more particularly to crushed rock where the mixing is not so exacting as in the fine sands and gravels, but where a three-in-one machine is wanted to leave the road surface ready for the roller. This machine has accomplished this, eliminating considerable extra equipment formerly required for spreading and edging only.

"The Highway Engineer is one of the leading social servants of the country."  
—Dr. A. L. Barrows, Executive Secretary, National Research Council.

## THE NATIONAL CARBIDE V-G LIGHT

Gives you daylight conditions on night jobs. Spreads a full, even beam of 8000 candlepower right where you need it.

Lights up the job for twelve hours on one 7-pound charge of National 14-ND Carbide and 7 gallons of water. Is easily handled by one man; has nothing to get out of order; no harm done if it tips over—just stand it up again, and it goes right on working. Weight 35 lbs. empty; 98 lbs. when full.

Write for catalogs on V-G Light, V-G Handy Light and Lantern

NATIONAL CARBIDE CORPORATION  
LINCOLN BLDG., NEW YORK  
(Opp. Grand Central)



The New GMC Line Includes This 1 1/2 to 2-Ton Truck

## New Competitive Trucks For GMC's 1937 Line

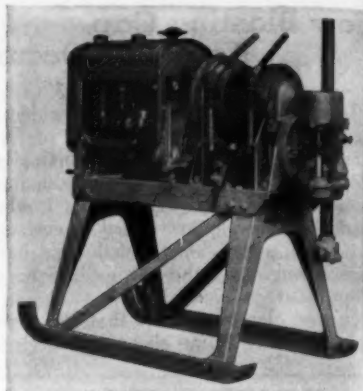
All the new 1937 truck models of General Motors Truck Co., Pontiac, Mich., have been advanced in appearance value with new stream-styled contours fully matching the progress achieved in 1937 passenger cars. For the first time in its history, this company has introduced a new light short-wheelbase unit in the low price field. It is a 112-inch wheelbase truck, rated at  $\frac{1}{2}$ -

ton capacity. Continued in the 1937 line is the 126-inch wheelbase  $\frac{1}{2}$ -ton unit.

Indicative of the trend towards cab-over-engine design is the complete line of COE models ranging in carrying capacity from  $1\frac{1}{2}$  to 12 tons. All models in the GMC line have been improved and refined. They are offered in twelve color combinations and with new all-steel "helmet top" cabs both standard and de luxe.

## A Fast Light Core Drill

A light-weight core drill, one of the smaller of the Sullivan family of core drills, which is 4 feet 7 inches high and weighs little over 1,000 pounds, has been announced by the Sullivan Machinery Co., Michigan City, Ind. The new No. 12 has a 50 per cent increase in drilling speed. Four compact parts, the hoist, engine, swivelhead and frame, can be quickly dismantled for easy transportation. The hydraulic or screw feed swivel



The New Sullivan Core Drill

head can be set for drilling at any desired angle. Variable speeds make for efficient operation in either soft or hard formations. The new core drill is described in detail in Bulletin D-10 which may be secured direct from Sullivan Machinery Co.

# for YOUR 1937 REQUIREMENTS

- ✓ MORE SPEED
- ✓ EXTRA CAPACITY
- ✓ LESS MAINTENANCE

### Greater Reduction in One Process

#### TELSMITH-WHEELING JAW CRUSHER

A super-strong, all steel, force feed jaw crusher. Cylindrical roller bearings give higher speed and larger output... reduce frictional loss... consume less power. Three toggle settings give greater reduction at coarse or fine adjustment. Six sizes. Write for Bulletin W-34.

### Greater Tonnage... a Finer Product

#### TELSMITH GYRASPHERE CRUSHER

The only secondary crusher with the double wedge crushing action... works at choke feed... turns out a greater tonnage of more cubical aggregate... crushes finer with lower power consumption. Spring relief... spherical head... roller thrust bearings. Four labyrinth seals and two piston rings reduce oil and maintenance costs to a new low. Write for Bulletin Y-34.

### Uniform Screening... Wet or Dry

#### THE TELSMITH PULSATOR

Screens sand, gravel, crushed rock, ore or coal... wet or dry... efficiently. Maximum screening action... uniform on every inch of the wire... on every deck... under any load. Better built for a longer life of heavy-duty, low up-keep service. Write for Bulletin V-34.

### SMITH ENGINEERING WORKS

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Associates in Canada: Canadian Ingersoll-Rand Co., Ltd., Montreal, Toronto, Winnipeg, Vancouver

50 Church St. New York City	301 N. Wells Chicago, Ill.	1013 Commercial Trust Bldg. Philadelphia, Pa.
81 Binney St. Cambridge, Mass.	412 Westinghouse Bldg. Pittsburgh, Pa.	Abrams-Anderson Co. Detroit, Mich.

MC-6

## Salmon R. Cut-off Nearing Completion

**Stage Construction Work Started With Well-Chosen Location and Grade, Now Has Plant-Mix Top**

THE Salmon River Highway which provides the shortest route between Portland and the Tillamook County beaches at Neskowin, Oceanlake, Delake, Nelscott and Newport served by the new coast highway is 28 miles shorter than the old route, hence the term Salmon River cut-off. New construction on this highway has been financed with Forest Highway funds and has been under the immediate supervision of the U.S. Bureau of Public Roads, District 1, Portland, Ore.

The Salmon River cut-off is a notable example of stage construction. Effort was first concentrated in getting the road through as quickly as possible to secure the benefits from the investment immediately. To accomplish this, economies in initial construction were practiced, structures were often temporary, and the surfacing was of a very low type initially. The original grading was carried to the narrowest possible two-way standard. The first work on the Salmon River cut-off was in 1927 when a graded dirt road of minimum width was built. This made it possible to get the road through quickly. Final alignments and grades were considered with care in the plans so that the maximum salvage in the future construction stages could be obtained. In subsequent years surfacing and grading contracts were awarded.

In September, 1935, the final step in the construction was started, all sections not previously built to ultimate standard were widened and all surface courses were laid over the old surfacing to provide a sub-base 17 inches thick of water-bound macadam which is to support the 3½-inch bituminous plant-mix pavement. The contract for this pavement is to be let shortly.

### Large 1936 Contract

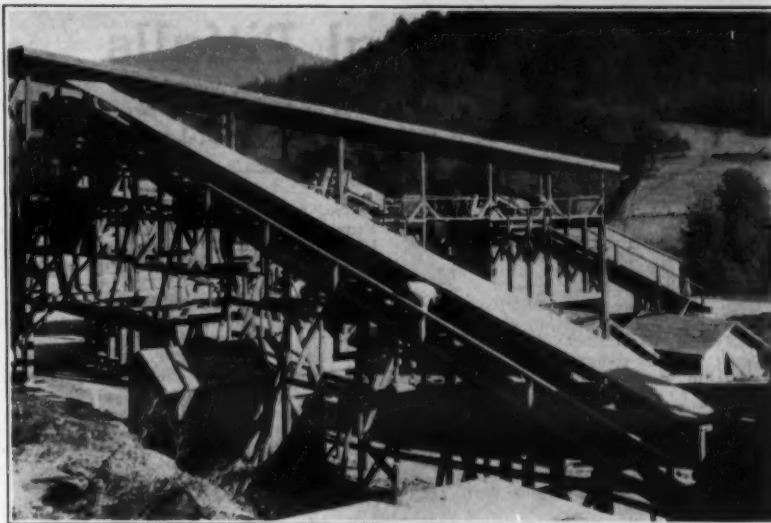
The 13.5 miles covered by a \$240,000 reconstruction surfacing and stockpiling contract awarded to E. C. Hall of Eugene, Ore., last summer is between Grand Ronde and Otis, where the Salmon River Highway connects with the famous new Oregon Coast Highway, which hugs the rugged coast line from border to border and which passes over six new large bridges, including the Coos Bay bridge which is 5,338 feet long and cost \$2,125,000, and the Yaquina Bay bridge which is 3,260 feet and cost \$1,335,000. The principal items covered by the Hall contract last season were: fine grading, subgrade and shoulders, 13.53 miles; special crushed rock bottom course, 90,000 tons; top course, 20,000 tons; leveling course, 7,000 tons; salvage of surfacing, 3,500 cubic yards; and supplemental crushed rock, 32,500 tons.

The sub-base was constructed under the typical choked stone specifications, building it up in successive 4 to 6-inch layers of coarse stone, 3 to ¼-inch, keyed with ¾-inch rock and screenings. The sub-base was topped with a course of fine crusher-run rock, ¾-inch to dust. Each layer was rolled with two 10-ton gas rollers. The finer layers were processed with water and a blade, and for this work two 10-foot blades and a 2,900-gallon water tank were used. The 3-inch rock was hauled only in six-wheel trucks and was spread evenly by a Jaeger spreader box which was hitched to the rear of each truck for spreading. Traffic was allowed to use the section with very little inconvenience during the entire period of construction.

### The Crushing Plant

Rock for the sub-base was crushed at a nearby quarry. The plant was operated 21 hours a day with three 7-hour shifts, producing 2,500 tons a day.

(Continued on page 27)



The Crushing and Screening Plant, Owned by E. C. Hall, Contractor, of Eugene, Ore., Which Furnished Aggregate for the Sub-Base and Surface Courses of the Salmon River Cut-Off

THIS COMPLETE  
LINE OF DEFENSE...

WILL PROTECT  
YOUR  
POCKET SHEET!

REX

CONSTRUCTION  
EQUIPMENT

A TOUGHER, FASTER LINE FOR PUMPING,  
MIXING AND PLACING

... Chain Belt's line of Rex Construction Equipment is a line of real veterans ... backed by over 25 years of front-line experience in a successful battle for concrete mixing, placing and pumping supremacy ... From the smallest Rex Speed Prime Pump to the mighty Paver—

each one knows its job thoroughly ... has the resourcefulness—the dependability—and the “stuff” to see your job through and bring home the profits. Send for our 1937 bulletins—get complete details on the Rex way to lower operating costs on any construction job.

CHAIN BELT COMPANY, 1666 W. Bruce Street, Milwaukee, Wis.

## CUMMER ASPHALT PLANTS

Two-Fire Dryer-Cooler  
For Either Hot or Cold Mix  
No Silos Required

LARGE CAPACITY PORTABLE PLANTS  
WITH 1-TON, 1½-TON OR 2-TON MIXER

Electrical or Mechanical Time Lock  
to Meet Any State Specifications

The F. D. Cumer & Son Co.  
17th and Euclid CLEVELAND, OHIO

## Avoid Legal Pitfalls

These brief abstracts of court decisions may aid you. Local ordinances or state laws may alter conditions in your community. If in doubt consult your own attorney.

Edited by A. L. H. STREET, Attorney-at-Law.

### Withdrawal of Bids When Mistake Occurs

Chapter 1: A contracting company bid on a sewer job. Before the city council acted on the bids, the company discovered that its bid was based on a miscalculation of labor and material costs.

Chapter 2: The company notified the city that the bid was withdrawn and demanded return of a \$2,500 certified check posted as security for entry into a contract on acceptance of its bid.

Chapter 3: Ignoring the company's notice and demand, the city accepted the bid.

Chapter 4: The company sued for return of its check.

Chapter 5: The Mississippi Supreme Court decided (*City of Hattiesburg v. Cobb Brothers Construction Co.*, 161 So. 676):

The construction company "had the right to withdraw its bid before the municipal authorities took any action thereon. A guaranty deposit can be recovered back by the bidder because of an honest mistake in calculation in making the bid, provided he gives notice of his withdrawal of the bid before any action is taken thereon."

The troublesome question in the case proved to be whether or not, under the local laws, the company's suit could be brought any time within six years from the time the right to sue accrued, or whether it had been barred by failure to sue within three years. The Supreme Court sent the case back to the trial court for rehearing of facts bearing on that question. It may be that the company waited too long before suing.

### Defaming Public Contractors

A contractor on public jobs sometimes needs the skin of a hippopotamus to protect him from the biting criticism of those who may create public noise about the way the work is being done.

In the case of *James v. Haymes*, 178 S. E. 18, decided by the Virginia Supreme Court of Appeals, plaintiff, a state road contractor, sued for damages on a theory of libel by defendant in publishing in the *Danville Register* that plaintiff was slow in performing one contract and had not completed another within the time required by his agreement.

One jury awarded the contractor \$4,500, but the Court of Appeals set the judgment aside for error of the trial judge in authorizing the jurors to assess punitive, as well as compensatory damages. (168 S. E. 333.) On the second trial, the jury allowed plaintiff \$5,000 damages. Again the appellate court set the award aside—this time on the ground that the evidence failed to show that the article complained of was so far false and an abuse of the privilege of criticism concerning a matter of public concern as to make the publisher liable. Said the Court of Appeals on the second appeal:

"Sound public policy requires that immunity should be granted to newspapers and other citizens in the discussion of public affairs, and, where the comment or stricture is based upon established facts, an action does not lie unless there is proof of actual malice, or the language used so exceeds reasonable limits that malice may be inferred therefrom."

### Rights Against Contractor's Bondsman Limited

"We guarantee that this highway contractor will pay all bills he incurs in connection with this road job," said a surety to the Commonwealth of Pennsylvania. That meant that any subcontractor or materialman could directly enforce a claim against the surety.

But controversy arose as to the extent of the surety's liability to a subcontractor on the road job. The sub excavated more earth than the principal contract called for, and he thought that the bondsman was liable for the excess excavation as well as that called for by the principal contract.

### SAND'S-STEVEN'S Line & Surface LEVEL



Endorsed and adopted by Road Builders and Contractors

Level is easily and quickly attached to line. Special feature construction prevents accidental detachment from line. Construction is sturdy, and accuracy, guaranteed.

SAND'S LEVEL & TOOL CO.  
8021 Gratiot Ave. Detroit, Mich.

"No, no, a thousand times no," said the Pennsylvania Supreme Court in the case of *Commonwealth v. R. L. Bonham Co.*, 147 Atl. 611. We quote from the opinion of that court:

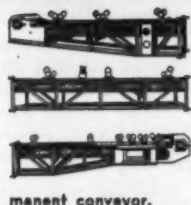
"If the grade was too high at the suggestion of the general contractor, and beyond the plans and specifications of the state highway department, the general contractor might be liable in some action, but the surety would not be responsible for work done beyond the terms of the plans and specifications. When the state highway department lets a contract, having a definite grade fixed for its roadbed, if the grade thus established is exceeded, the state highway department is under no compulsion to pay for it, and what the state highway department is not liable for to the general contractor, the bond is certainly not responsible for, nor can the general contractor, the other defendant, be held liable in this suit, as the action is on the bond, and, not directly on the subcontract."

### Lincoln Welding Consultant

Announcement has been made by the Lincoln Electric Co., of Cleveland, Ohio, of the appointment of John S. Humble as arc welding consultant for its Boston, Mass., office, located at 10

High Street. Mr. Humble has had considerable experience in the practical application of electric welding and will be available to arc welding users in the Boston territory for consultation on any question or problem about welding. J. E. Raney is in charge of the office.

### NEW WAYS TO CUT MATERIALS HANDLING COSTS



permanent conveyor.

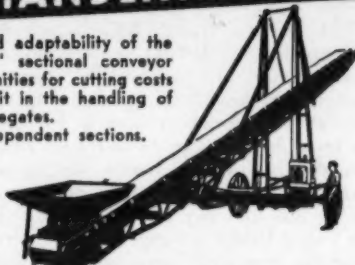
Easily disassembled, easily transported, easily reassembled. Our catalog describes our complete line of portable, sectional, and permanent conveyors designed to suit every contractor's requirement.

PORTABLE MACHINERY CO., York, Pa.; Clifton, N. J.; Chicago, Ill.

The flexibility and adaptability of the Porta "Model 347" sectional conveyor offers wide opportunities for cutting costs and increasing profit in the handling of concrete and aggregates.

Made up of independent sections.

Can be used on wheel truck, caster mounting or on supports as permanent or semi-permanent conveyor.



# TWO NINE HOUR DAYS IN ONE



JACOBSON AND McKINLEY believe in nine hour days for their Cletracs—nine hours before noon and nine hours after noon.

"Pleased—well pleased," they say in telling how two Cletrac diesel models FD have worked 18 hours per day for six months hauling 12-yard scrapers on an airport job at Latrobe, Pa. And for a good measure of praise they add "We have been operating two other 94 H. P. Cletracs constantly for over a year."

Whatever the job, the dependability of Cletracs makes for low cost earth moving... their ease of handling helps to get more work done, at lower cost. When you have a tough job—count on Cletrac.

THE CLEVELAND TRACTOR CO.  
CLEVELAND, OHIO

Only Cletrac  
has the advantages  
of CONTROLLED  
DIFFERENTIAL STEERING

CLETRAC CRAWLER TRACTORS

## Producing Rock For Paving Channel

(Continued from page 1)

into very irregular shapes, single blocks in excess of 25 or 30 tons seldom being encountered.

### Opening the Quarry

One of the three faces had been previously operated in a small way, while the other faces had to be cleared, the overburden removed, and the face opened. At the start of operations, rock in place was brought down with charges of powder and dynamite placed in coyote holes and pockets opening from them. The amount of the charge to be used was based on the amount of material in place above the level of the charge and in front of a vertical line extending up from it. No consideration was given to the amount of material which would be loosened back of the line vertical from the charge, even though this was largely due to the nature of the rock. Maximum charges used ran as high as 16 tons placed in the several different pockets in a tunnel, such charges bringing down as much as 50,000 tons of rock. Detonation of these charges was insured by the use of both electric blasting caps and Cordeau-Bickford detonating fuse connected into the charge in each pocket.

### Breaking Large Blocks

Large blocks of rock on the quarry floor are broken with small charges of explosive. Rock which does not contain too much debris from clay seams and overburden is broken to proper size by the use of plug and feathers where the block is to be broken in only two to six pieces. This method is essential as the rock is too hard to break with sledge hammers. Loading of spalls and paving stone into skips is done by hand, the skips being dumped into trucks by cranes, while toe trench stone is loaded directly by 2-yard shovels. When material on the quarry floor contains too much waste, it is loaded by shovel into dump trucks, then hauled and dumped over the edge of spoil banks, where a natural sorting occurs so that the separated rock can be loaded out from the toe of the bank.

### Well Drills Used

As production continued and the faces of the quarry became higher, the amount of overburden increased until it became necessary to strip above the face. At the same time, the method of bringing down rock was supplemented by the use of 5-inch well drills which put down holes back of the top of the face. This permits shooting out the upper part of the face so that it may be maintained at a flatter slope with the concomitant reduction of scaling hazards.

The largest face in the quarry is 750 feet long and 150 feet high and has cut

into the hill 100 feet. Major equipment in the quarry, at the peak of operations, consisted of seven Schramm and two Gardner-Denver compressors, with a combined capacity of 2,835-cfm; one 2-yard Osgood diesel shovel; one 2-yard P & H diesel shovel; two 1-yard Bay City diesel shovels; two 1-yard American diesel shovels; two 5-ton Bay City cranes; two 5-ton Osgood cranes; one 5-ton American crane; one 60-hp Caterpillar tractor with LeTourneau Angle-dozer; two 5-inch Keystone well drills and 165 4-yard International dump trucks.

At the peak of production, employees in the quarry, exclusive of those employed on transportation, numbered 2,200, the work being carried on 24 hours a day, six days per week. The total output of the quarry from October, 1935 to December, 1936 was 625,000 cubic yards.

The hauling of stone from the quarry to the various projects has been done with a fleet of 165 4-yard dump trucks. The average haul was 25 miles, the mile-

age per truck per month often being in excess of 9,000 miles.

### Safety

Safety is being stressed throughout the quarry operations. The problem of scaling was of such a hazardous nature that in order to provide safety for those working on the face and on the quarry floor below, it has been necessary to employ a crew of men especially trained in this type of work to scale continuously the several faces. Safeguards such as hard hats and safety belts are the rule for all hazardous work; a physician is maintained on the job; and every reasonable precaution is taken. In view of the fact that practically all the quarry employees had never seen a quarry before working on this program, and had to be completely trained for the job, the number of injuries which have occurred is much less than might be expected.

The flood control work being carried on with E.R.A. funds is under the direction of Major Theodore Wyman, Jr.,



Large Blocks of Rock on the Quarry Floor Ready to Be Broken by Explosives or Plug and Feathers

District Engineer. The quarry is under the general direction of Harry Hodgman, Area Engineer, while Robert L. Gibson is in direct charge of all quarry operations. This article was prepared by the Operations Division of the U. S. Engineer District Office at Los Angeles, Calif.

follow the trend

# Johnson-Necaro

## NEW YORK CITY

In June, 1936, less than ten months ago, Johnson-Necaro Company, New York City, bought their first LIMA. Since then they have purchased a total of fourteen LIMA machines. Ten of these are now rushing to completion the 7,000,000 yard New York World's Fair job. The Arthur A. Johnson Corp. realized LIMA'S superior qualities in 1935, when on the Quabbin Reservoir Dike job at Enfield, Massachusetts; four LIMAS were used to handle the work. Recently when four additional machines were needed by Johnson-Necaro Co., LIMA again got the call, making a total of eighteen efficient LIMA excavators for the two companies.

**LIMA**

SHOVELS-DRAGLINES-CRANES

LIMA LOCOMOTIVE WORKS, Incorporated  
SHOVEL and CRANE DIVISION LIMA, OHIO, U. S. A.

NEW YORK 107th St. and Sedgwick Avenue	CHICAGO 1543, 319 So. Michigan Building	NEWARK, N. J. 317 Fallington Avenue
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Tyco Machinery Company, Ltd. Vancouver, B. C.		LOS ANGELES 1801 Santa Fe Avenue
The General Supply Co. of Canada, Ltd. Ottawa, Ont.		MEMPHIS 77 McCall Street

## WON'T QUIT or cause time out



A Hayward Bucket keeps the job going ahead on scheduled time. It won't quit or cause time out.

The Hayward Company  
32-36 Dey Street  
New York, N. Y.

## Hayward Buckets

## Dual-Type Paving On 5.6-Mile Pa. Job

(Continued from page 1)

swinging a Williams 1-yard clamshell. The sand was delivered by gondola car from the Highspire plant of the Susquehanna Sand & Gravel Co. on the Susquehanna River about 6 miles below Harrisburg and was unloaded by the same crane. One man was kept in the cars cleaning up.

The 2-batch locally-hired trucks backed under the batchers to receive the 2,194 pounds of stone and 1,358 pounds of sand and then drove into the depressed roadway beneath the cement platform. Each batch received 620 pounds of bulk cement. Each truck was equipped with a Titcomb bag made of rubber-covered fabric for holding the cement and preventing moisture from the sand affecting it.

Two openings in the cement platform, each equipped with a V-shaped funnel and canvas tube, were used to deliver the cement to the rubber bags. Each rubber bag was attached to the batch gate or front of the cab with canvas straps which held it, when empty, in such a position that the opening was toward the back of the truck. The two men who handled the filling of these bags turned the opening of the bag upward while the men at the top emptied the Kone Karts. Just as the bag was filled the two sides of the opening were quickly lapped to prevent spilling. The contractor kept two cars of bulk cement open and had two men wheeling and two men helping shovel. Each batch of cement was weighed on the Fairbanks cement scales and then wheeled forward on the platform to the dumping dock.

On the batching plant there was one weighman and another to spread the sand on top of the batch and to lay out the Titcomb bags. When necessary to move sand cars, the crane and a steel cable were used.

### Pouring Concrete

The subgrade for the two 10-foot concrete strips was prepared by a Caterpillar Twenty power grader. This was followed by a Ted Carr Formgrader and a crew of ten men trimming the form trench and setting the 9-inch Blaw-Knox steel road forms. The grade ahead of the forms was compacted with a 10-ton Galion gas roller. A subgrader powered with a Hercules engine trimmed the subgrade to proper crown and then an Austin 5-ton three-wheel Pup roller compacted it. Final checking of the grade was done by a Cleveland trail-grader and then four men with a Cleveland scratch template cleaned up.

Where the two 10-foot strips came together, eliminating the bituminous center strip, the slabs were keyed by placing a removable steel plate against the forms and 1/2-inch round deformed dowels 5 feet long and spaced 5 feet on centers were bent so that half of the dowels entered the first strip poured and the other half lay within the key and against the steel forms. When the second slab was poured, these dowels were straightened, thus forming a bond between the two strips of concrete.

Translode expansion joints were used on this job with 3/4-inch premoulded material and spaced 77 feet apart. The caps had two 1-inch legs, with plates welded at the top to project horizontally and with holes for 1-inch stakes to hold the joints firm. This is a new type of support used for the first time on this job. One man was kept ahead oiling forms and another cleaning the edges of the pavement against the slab and form, removing excess dirt.

The Rex 27-E paver in which the concrete received a 1 1/4-minute mix pulled a strike-off 1 1/4 inches below the top of the forms, using the paver hoist for

power. Bar mats shipped complete with wire ties were placed on the struck-off concrete. The concreting crew, in addition to the paver operator, consisted of four puddlers, two spaders, one of whom also cleaned the adjacent slab, and the operator of the Lakewood finishing machine. One of the spaders and one puddler carried in the bar mats after the concrete was struck off. As protection to the paver hose and also as a beam for carrying the outer sheave for the strike-off cable, the contractor had a 2 x 12-inch plank bolted to the front of the paver with a 4 x 4-inch diagonal brace.

### Hand Finishing and Curing

The hand finishers used 10-foot triangular lutes cut from 4 x 4's. The two finishers pulled the caps from the expansion joints and finished the joint. Two other men did the edging on the sides and then dragged burlap tacked to the top of a 2 x 2 pole with 4 x 4 x 2-inch blocks at either end to hold the front edge of the burlap at a uniform

elevation above the fresh concrete.

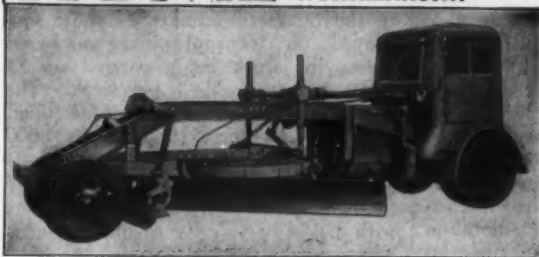
The curing was done with cotton mats 16 feet long x 12 feet wide rolled on 2 x 2's with the edges folded in. These mats, made by the Advanced Concrete Road Curing Co., have burlap for the top and bottom with a cotton filler quilted by stitching on 4-inch centers. These cotton mats were kept damp at all times and were sprinkled immediately after they were spread. Two men

were assigned to the sprinkling which continued for the full 72 hours that the mats were in place. The contractor used the flag system to indicate each day's run so that the mats to be removed were clearly indicated.

### Miscellaneous

The contractor used a Barnes triplex  
(Continued on page 50)

## ROME DESIGN MATERIALS WORKMANSHIP



ROME DESIGN has been copied but never equaled. ROME MATERIALS are selected to conform to definite specifications. ROME WORKMANSHIP is first-class in every detail. DEALERS in principal cities.

Bulletins on request

**ROME GRADER AND  
MACHINERY CORP.**  
ROME, NEW YORK

Manufacturers of  
"High Lift" Graders, Auto  
Mowers, Motor Graders and  
Snow Plows



"Our 3/4 yd. P&H has dug and loaded as much as 700 yds. per day . . . better production than most 3/4 and 1 yd. shovels in this territory"—J. F. Carter, County Road Supervisor, Abbeville, Alabama.

## Why P&H's CHAIN CROWD is Better



1. Rapid reversing planetary with positive chain — returns dipper at 150% of crowding speed.
2. Permits shorter boom—less weight, less counterweight—less waste of power.
3. Accuracy to dig within 1 inch of grade.
4. More economical—P&H crowd chain lasts from 3 to 5 years.

P&H patented the rapid reversing planetary with positive chain crowd—perfected its use. Its most advanced application is found on all P&H Pacemakers—built by the Harnischfeger Corporation.  
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P&H Model 150 on Road Work in Henry County, Ala.

# HARNISCHFEGER

CORPORATION

EXCAVATORS • ELECTRIC CRANES •  HOISTS • MOTORS • ARC WELDERS

## Shaving a Cliff On Mountain Road

Owens, Babb & Thorkildson  
Required to Blast So As Not  
to Block Arkansas River in  
Colorado

THE most ticklish work on the \$119,460.77 contract for 4.109 miles of grading between Cotopaxi and Texas Creek, Colorado, awarded to Owens, Babb & Thorkildson of Denver, was the removal of about 4,500 yards of rock 60 feet high from the face of a cliff without landing too much in the Arkansas River and damming it. It required the proper arrangement of the holes and the right amount of explosive to land the rock in the roadway or along the canyon wall rather than in the river. Further, if the rock fell down onto the existing road it would block it for a longer time than the traffic could normally accept.

The rock cut mentioned was about 1 mile from the east end of the job. The work was handled expeditiously by taking the face off the cliff in three lifts and by using stoep holes and light charges on the down holes. The stoep holes were drilled back the full 12 feet that the new grade required.

By drilling the vertical holes 12 feet back from the face of the cliff and loading them very lightly, then drilling the holes running back from the face and loading those holes heavily, the contractor was able to blow the rock laterally along the right-of-way rather than across it and prevent long delays to automobiles and a minimum of material landed in the river. Forty per cent gelatin dynamite was used for the explosive. About 12 to 18 feet of the face of the cliff was shot at a time.

Where this work was underway the old grade was raised about 4 feet for the full length of the rock cut, about 600 feet. A Gardner-Denver 394-foot compressor mounted on steel wheels and with a vertical air receiver mounted on the same trailer chassis furnished the air for drilling. The compressor was driven by a Caterpillar Seventy-Five diesel tractor from the power take-off through a 5-part V-belt. The air was delivered to the line at about 80 pounds, and the line was a 2-inch diameter pipe carried over the top of the cliff being drilled.

### Equipment and Labor

The contractor uses Crusca detachable bits from 2-inch down to 1 1/8-inch and grinds them in his own shop. Other equipment used for the removal of rock and earth on this job included an old Packard engine driving a Gardner-Denver one-hammer compressor through a V-belt drive. A Caterpillar Sixty-Five with a LeTourneau bulldozer cleared the roadway for the trucks hauling rock and also smoothed the fills. Other rock-moving equipment included a Thew-Lorain 75A, a Bucyrus-Erie 37B shovel with a 1 1/4-yard Amsco rock dipper and a Caterpillar Seventy-Five diesel with an Adams No. 12 pull grader and a Caterpillar Sixty gas tractor with a LeTourneau bulldozer.

Much block-holing of boulders was required because of the light shooting required on the face of the cliff. There was also a large amount of slide material and shattered rock on the job which could be removed by the shovels without blasting.

The hauling equipment, all company-owned, included four 8-yard, three 5-yard and one flat rack International trucks.

The hours for labor on the contract were two seven-hour shifts for five days a week for the shovels and 10 hours on the sixth day. The drillers and labor



C. & E. M. Photo

Drilling the Lift Holes

worked two 6-hour shifts for six days a week.

There was only one Simon-pure earth-

cut on the entire job and that was of 9,000 yards which was removed with a 12-yard Carryall scraper.

### Personnel

Ed Owens was Superintendent for the contractor and John W. Robertson was Resident Engineer for the Colorado State Highway Department on this contract.

### Diesel-Powered Ditcher Working in California

The accompanying photograph shows a Buckeye traction ditcher which in a normal 8-hour day digs 1.25 miles of ditch 5 feet in depth at a fuel cost of but 80 cents. The ditcher is powered with a 4-cylinder 55-hp Cummins diesel engine. This particular installation, working in California, uses a standard type of power unit equipped with a Twin Disc clutch through which power is furnished to the crawler track, mud conveyor and bucket wheel.

The trend to diesel power by contrac-

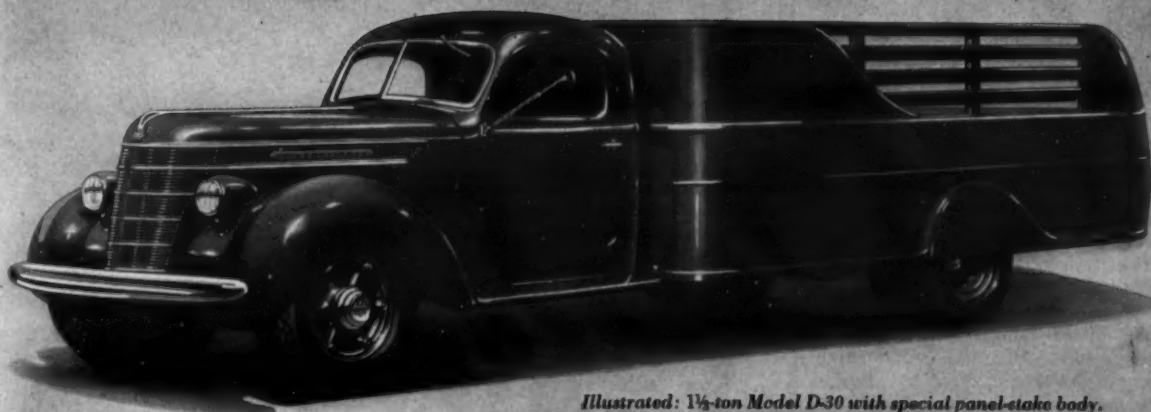


A Diesel-Powered Ditcher at Work in California

tors has entered the field of specialized equipment. An all-time high was reached during 1936 in the sale of diesel tractors, shovels and graders, and a number of manufacturers of road rollers, ditch diggers, portable welding equipment and air compressors have announced diesel-powered units.

# of the *New* FIRST SHOWING INTERNATIONALS

International Harvester presents a great new line of trucks—a major news story for the transportation world—a personal news item for every user of trucks!



Illustrated: 1 1/2-ton Model D-30 with special panel-stake body.

HERE is the first announcement of the new International Trucks in the gleaming metal dress of today and tomorrow. Here are eye-values that tell their own story, ultramodern styling to please every owner and driver, your customers and the general public. But eye-values are not the whole story; more important, in these new trucks, are new values underneath the surface.

Consistent International policy, adhered to through more than 30 years of ALL-TRUCK manufacture, is your guarantee that an entirely new beauty of exterior in International Trucks

brings also advanced engineering throughout the mechanical product.

New standards of utility and performance are offered you in every model of this new line, in sizes ranging from the Half-Ton unit up to powerful Six-Wheelers. The new International Trucks are at your service, on display at International dealer and branch showrooms. Folders describing sizes and styles used in your own hauling work will be sent on request.

INTERNATIONAL HARVESTER COMPANY  
606 S. Michigan Ave. (INCORPORATED) Chicago, Illinois

# INTERNATIONAL TRUCKS



A Caterpillar RD6 Was Used to Clear the Way Through the Jungle

## Building a Road Among Ant Hills

Contractors In Tanganyika, East Africa, Show Machine Superiority over Natives

TWO thousand natives and their primitive tools had worked a year with slow, costly progress on the construction of a dirt road leading from a railway station in Tanganyika, East Africa, to the Lupa goldfields. Heavy, tangled tree and underbrush growths and ant hills, some of them 15 feet high and 50 feet diameter at the base, were obstacles

### Booklet on Road Resurfacing

An interesting, and well-illustrated booklet, describing the use of Trinidasco for building, resurfacing and maintaining pavements has recently been published by the Barber Co., 1600 Arch St., Philadelphia, Pa.

Trinidasco is a cold-laid mixture of which Trinidad Lake asphalt is the major ingredient and has been in use since 1930. The process consists of dispersing the pulverized asphalt into a mixture of crushed stone, stone screenings or natural sand, mineral fillers and a special emulsified fluxing agent. The water of the emulsion eventually disappears from the mixture, leaving the pavement composed of virtually the same ingredients as if it had been hot-mix.

Copies of this booklet may be secured by contractors, state and county highway engineers direct from the Barber Co. by mentioning this magazine.

too tough for man-power to surmount. Coupled with these difficulties was the fact that the farther away from the railroad the work progressed, the smaller and more costly the force of native workmen became.

Gailey & Roberts of Nairobi and their earth-moving machinery were called in. The ant hills were found to be not only high, but hard, and as to location, they seemed to favor the site selected for the proposed right-of-way. In the tops of some of these ant-made mountains, large trees were well rooted.

The contractors' method was simple but effective. Attaching a cable to a tree, and the other end to the Caterpillar drawbar, the right-of-way was soon cleared of trees. Then the diesel tractor pulling a ripper chopped the tops off the ant hills and following up with the grader, levelled them. The tractor and grader then cut the roadway 50 feet wide, and with the drainage ditches at the side, at the rate of about a mile in 19 hours, or more than twice as fast as



A Group of Natives Starting Work on the Itigi-Lupa Road, Tanganyika, East Africa, Which Was Completed with American Road Building Equipment

the road-building efforts of the 2,000 natives.

British government officials were greatly impressed with the work of the diesel tractors and the job was a feather in the contractors' cap in more ways than one. Soon afterward, Gailey & Roberts received the contract to build a

large airport at Kampala, Uganda, and for this job ordered three more diesel tractors and three 8-yard Carryall scrapers. They now have several diesel tractors, equipped with either scrapers or roadbuilders, working in this region on various dirt-moving and land clearing tasks.

# When your trucks have to *take it...*



You will get at least 3 to 4 times longer service, when, instead of ordinary grease for chassis lubrication, you use Texaco MARFAK.

BACKING under shovels, pulling out of deep pits, creeping over "impassable" terrain, up to the hubs in sand and mud is severe on any engine oil.

Here's one that is made for this service—New Texaco Motor Oil.

New Texaco is purified by the Furfural Process. Furfural is a farm product made from oats, corn, wheat, cotton seed, sugar cane, etc. In refining, this fur-

fural dissolves out tar, gum, and other sludge forming elements present in all crudes. What is left is *all lubricant* . . . oil with a film that can take it in the toughest service.

Trained lubrication engineers are available for consultation on the selection and application of Texaco Petroleum Products. Prompt deliveries assured through 2020 warehouses throughout the United States.

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## Industrial Lubricants

**MORE YARDAGE** *per day*



because of  
power and  
less cable  
overhaul.

The Williams "Champion" Bucket, shown at left, is a POWERFUL digger. The exclusive power-arm combination of lever and block-and-tackle gives a amazing strength.

Write for new bulletin.

THE WELLMAN ENGINEERING CO.

7012 Central Avenue, Cleveland, Ohio

**WILLIAMS**  
POWER-ARM, POWER-WHEEL, MULTIPLE-ROPE,  
DRAGLINE . . . *buckets*

### New Branch Managers For Black & Decker Co.

The Black & Decker Mfg. Co., of Towson, Md., has announced the appointment of John M. Schreiner as Manager of its Detroit branch, succeeding the late George W. Stoiber. Mr. Schreiner has been active in the Detroit territory for the past twelve years.

W. J. Fenwick who for the past several years has been co-manager of the Cleveland territory has been appointed Manager of that branch. G. H. Treslar has been appointed Supervisor of both

the Detroit and Cleveland territories and will cooperate with Schreiner and Fenwick in working with Black & Decker distributors to promote sales and service in these areas.

### Road Signs Ruled Off Roads in Belgium

Considering that the placing of advertisements and markings along public roads tends to distract the attention of drivers from the regulation traffic signals, a Belgian royal decree of January 28, effective February 11, 1937, modifies the present regulations on

traffic circulation, according to a report from the U. S. Bureau of Foreign and Domestic Commerce.

It is now specifically forbidden in Belgium (1) to erect signals other than those provided by the regulations, to give the public the same indications as those of the regulation signals; (2) to place advertisement boards or to affix inscriptions likely to mislead road users; (3) to place any marks or inscriptions on road surfacings; (4) to place in the vicinity of regulation signals advertising or other boards or signs likely to detract from the visibility and efficiency of regulation signals.

### New Calif. Distributor for International Harvester Co.

The Smith Booth Usher Co., of Los Angeles, Calif., has recently been appointed by the International Harvester Co., of Chicago, as its distributor for International TracTracTors, wheel-type tractors and power units in the territory of southern California and part of Arizona. A complete line of International industrial power equipment in various sizes and adequate repair parts will be carried and efficient mechanical service will be available at all times.

# BAY CITY "45" TRENCH HOE

a 20 foot trench in heavy clay!

### Look at that smooth bank

Look at the work of this  $\frac{3}{4}$  yard Bay City Trench Hoe, owned by the City of Saginaw, Michigan (Dept. of Public Works)! That fine side cutting you see on this 15 ft. wide trench was done on a City Storm Sewer Project. There's a special length boom and stick on this machine, increasing its normal depth range from 17 to more than 20 ft. Powered with a Buda Diesel Motor, this is a fine investment, a great all-round municipal outfit, operating as it does Shovel, Dragline and Clamshell attachments. Like all the many Bay City models, it has everything you want for profitable, speedy digging.

There are 10 models of Bay City Shovels—ranging in sizes from  $\frac{3}{8}$  to  $1\frac{1}{4}$  yd. sizes. No matter what your shovel need—you'll find the answer in a Bay City, at the price you want to pay. Write for details.

### 25 REASONS FOR CHOOSING BAY CITY

- 1—Convenient economical weight.
- 2—Helical cut gears—noiseless, long wearing.
- 3—Unit (nickel-manganese) car body and machinery table, totally heat treated.
- 4—Frictionless bearings thrust.
- 5—6-cylinder power.
- 6—Extra large diameter swing roller-path.
- 7—Overload clutches & brakes.
- 8—Drop forged crawler shoes.
- 9—Long crawlers—low bearing pressure.
- 10—Chain crowd with automatic adjustment.
- 11—Swing lock—in any cab position.
- 12—Automatic Travel lock.
- 13—Extra heavy cab. Plenty inside working room.
- 14—Fast operating speeds.
- 15—Two travel speeds.
- 16—All steel construction.
- 17—Three lever control.
- 18—6-2 clutch control.
- 19—High pressure lubrication thrust.
- 20—Safety worm boom hoist.
- 21—Separate hoist drums.
- 22—Internal swing tooth.
- 23—Unequaled steering at full speed.
- 24—Convertible—without machinery change.
- 25—Accessibility for inspection or adjustment.

Send for details

## BAY CITY SHOVELS INC.

EASTERN OFFICE ROSELLE, N. J.  
BAY CITY, MICHIGAN

## The Casper-Alcova Irrigation Project

(Continued from page 8)

new Northwest  $2\frac{1}{2}$ -yard oil-engine-powered shovel was placed in the borrow pit to load the heavy clay to Condon's fleet of eleven Allis-Chalmers Speed-Aces, each of which hauls from 6 to 9 yards per trip at speeds ranging from 5 miles an hour on the steep upgrades to 18 miles an hour on the level. These Speed-Ace hauling units use fuel oil in their power units, each unit requiring about 30 gallons per seven-hour shift on a  $\frac{3}{4}$ -mile haul. As the cost of tractor fuel is 5 cents a gallon, compared with about  $15\frac{1}{2}$  cents for gasoline, the estimated saving by using this type of fuel is about \$104 a day. Each hauling unit makes 40 round trips per seven-hour shift on a  $1\frac{1}{2}$ -mile round trip and works 21 hours a day.

Other equipment used by this contractor includes an A-C Model L and a Model K tractor, and a Caterpillar Fifty equipped with a bulldozer.

### Seminole Dam

Seminole Dam is located in Granite Canyon, between the Seminole Mountains and Bennett Mountain, about 33 miles northwest of Rawlins, Wyo. Constructed of concrete, this arch-type dam will be 260 feet high, with a crest length of 540 feet. The reservoir, providing a capacity of 1,020,000 acre-feet, furnishes the water supply for the project and also will provide an annual power output of 140,000,000 kilowatt hours, with its outflow redistributed by the Pathfinder reservoir, located a few miles downstream.

Winston Brothers Co. and Associates, including Winston Brothers Co. of Minneapolis, Minn.; Utah Construction Co. of Ogden, Utah; W. A. Bechtel Co., of San Francisco; Morrison-Knudsen Co., of Boise, Idaho; and Henry J. Kaiser Co., of Oakland, Calif., received the contract for this part of the project on their bid of \$2,194,007. The contract includes stripping the canyon wall, the spillway tunnel inlet and outlet cuts, the construction of the spillway tunnel, the dam, power plant and a diversion tunnel.

In addition to the excavation necessitated by the above, the contractor has excavated footings in the rock of both canyon walls for the erection of a 12-ton movable cableway, traveling 150 feet up and down stream, which will be used for placing the concrete in the dam. A screening and washing plant has been erected  $2\frac{1}{4}$  miles upstream for the preparation of the aggregate necessary for the 185,000 cubic yards of concrete required. Aggregate is dug from the river bottom and stockpiled at



This Caterpillar RD8 Owned By Winston Bros. Was Dropped Over 200 Feet of 85 Per Cent Grade by a  $\frac{3}{4}$ -Inch Cable Fastened to Its Drawbar. The Unit Bulldozed Going Down and Was Pulled Back by a Willamette-Hyster Winch.

the screening plant. An aerial tram, using 32-cubic foot buckets, will carry the aggregate to the mixing plant on the canyon wall above the dam. The mixing plant will be equipped with one 4-yard mixer and weighing batchers, and a 3,800-barrel steel silo for the storage of bulk cement which will be brought in by tank trucks from the nearest railroad point, at Parco, 37 miles away.

### Work on Casper Canal

Most of the work on the Casper Canal and all of the work on laterals is being done by government forces, only 5.6 miles of the canal work being done by contract. The contract work on the first 3.6 miles of the 60-mile canal included two concrete-lined tunnels of 2,860 and 4,420 feet, one 300-foot and one 18-foot siphon, one 73-foot reinforced concrete highway bridge, and 2.1 miles of canal excavation involving 444,000 cubic yards, all of which has been completed.

A contract for the construction of four concrete-lined tunnels, totaling 2 miles in length, was awarded to W. E. Callahan Construction Co. and Gunther & Shirley in January, 1936. The first and longest of these tunnels is located 20 miles west of Casper, is 16 feet in diameter and 6,100 feet long. Boring, principally by blasting, has progressed at the rate of 24 to 26 feet every 24 hours, working in three shifts. An average of 150 to 190 cubic yards of rock is moved each day. The material is of



Interior of the Power House on the Callahan-Gunther & Shirley Job

shale formation, too sticky for a rotary outfit, and requiring about 250 pounds of dynamite a day.

To furnish power for this work, the contractors set up a power plant consisting of three 125-hp and one 77-hp Caterpillar diesel engines, neatly housed in a sheet metal building located on a plateau near the scene of operations. Two of the larger units are connected

(Continued on page 40)

## BUCYRUS - ERIE

*M*ANY new features put the 120-B out in front in power, speed, output capacity and money-saving efficiency. This famous 4-yard, heavy-duty shovel offers quick accelerating swing and positive spotting, ready mobility, wide digging and dumping radius, and convenient convertibility for most economical use in any type of digging. Send for the new 120-B bulletin.

**PILE HAMMERS  
and  
EXTRACTORS  
HOISTS-DERRICKS  
WHIRLERS**

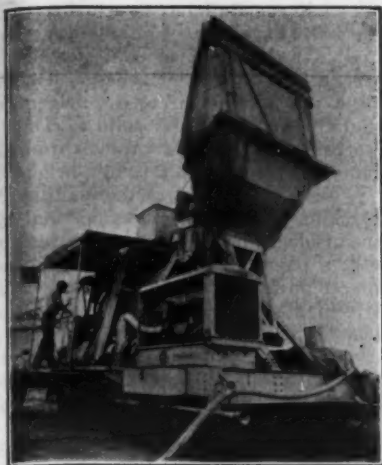
Special Equipment  
Movable Bridge Machinery

Write for descriptive catalogs.

**McKIERNAN-TERRY CORP.**  
19 Park Row, New York  
Distributors in Principal Cities

**BUCYRUS  
ERIE**

EXCAVATING, DRILLING, AND MATERIAL HANDLING  
EQUIPMENT... SOUTH MILWAUKEE, WISCONSIN, U.S.A.



The New Ransome Paver Powered by a Buda Diesel Engine

### Diesel-Powered Pavers

Many types of construction equipment have gone to diesel power in the last few years but few manufacturers have offered diesel-powered pavers. One of the first paver manufacturers to take this step is the Ransome Concrete Machinery Co., Dunellen, N. J. In the spring of 1935 the B. Turecamo Contracting Co., Brooklyn, N. Y., purchased a 27-E Dual Drum Ransome paver powered with a Model 6-LD-909 Buda diesel 6-cylinder engine with 909 cubic inches displacement, a 5 1/4-inch bore and 7-inch stroke.

Recently the Ransome Co. brought out another diesel-powered model, a 27-E single-drum paver powered with a Buda Model 6-LD-468, 6-cylinder engine of 468 cubic inches displacement, 4 1/4-inch bore and 5 1/2-inch stroke. This engine, like the larger model, has the controlled turbulence combustion system providing a low compression ratio, lower operating pressures and hence less wear on bearings and reciprocating parts.

A diesel engine to stand up under paver operation must be well-designed and engineered. The illustration shows the proximity of the engine to the power-loader skip. Every time material is dumped into the skip a cloud of dust is released. In order to withstand this condition, all wearing parts of the engine must be fully sealed and protected.

Because of the savings in operating costs enjoyed by the users of diesel-powered construction equipment, it is not unreasonable to expect that there will be an even greater use of diesel power in the next few years.

### A New Streamlined Air-Cooled Engine

In accordance with the trend of the times, the Novo Engine Co., 216 Porter Street, Lansing, Mich., is now manufacturing a streamlined air-cooled engine. It is a 2-hp unit, streamlined for



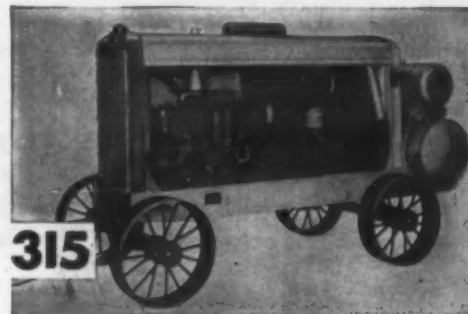
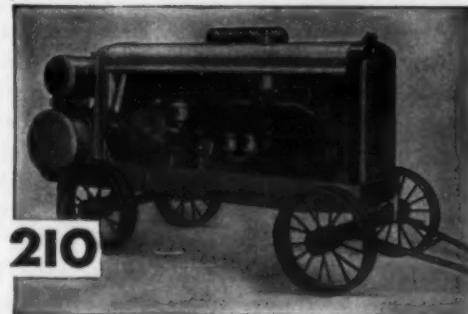
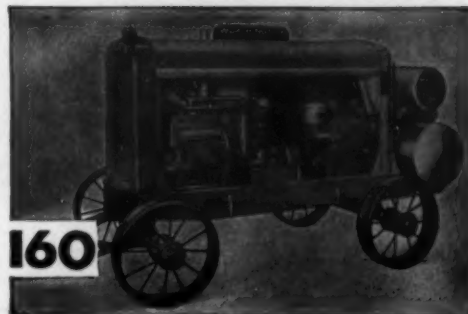
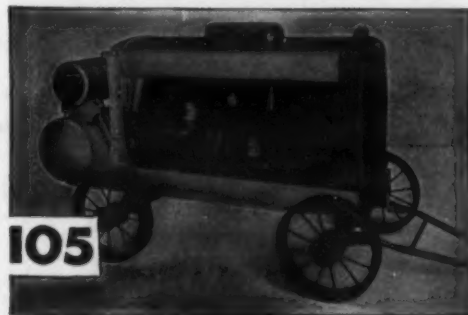
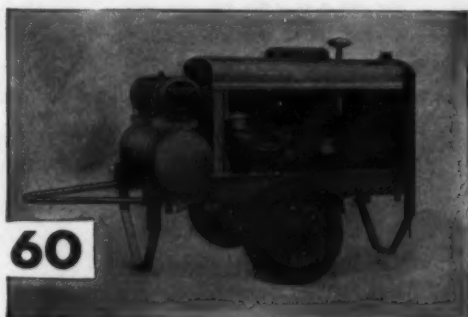
The New Model A-16 2-Hp Streamlined Engine

the most efficient flow of cooling air over the head and block as well as for appearance. Care in design has resulted in lightweight per horsepower developed, the net weight being only 97 pounds. The mounting dimensions are 10 x 10 1/4 inches.

One of the features of this engine is the protected position of the carburetor which is tucked away behind the heavy steel end plate, eliminating the possibility of bumps and knocks from injury to this piece of mechanism. The magneto is a flange-mounted standard rotary-type with impulse coupling. For light weight and added strength, a new type pressed steel connecting rod is used in these engines.

To facilitate ease in starting, the engine is cranked off the camshaft which spins the engine at double engine speed. The impulse coupling gives a hot spark for starting.

Complete information on this Model A-16 may be secured direct from the manufacturer by mentioning this magazine.



### STERLING BALANCED WHEELBARROWS



Greater part of load balanced over wheel

NO. 518 CONCRETE BARROW

A COMPLETE LINE OF STERLING WHEELBARROWS AND CONCRETE CARTS

STERLING WHEELBARROW CO., MILWAUKEE, WIS.



## Better Equipment For Greater Profits

WORTHINGTON Portable Compressors will stand the gaff...the constant daily grind...under all conditions.

Ask for a demonstration on your own job...on road work, pavement breaking, drilling, sheeting driving, trench digging, tamping...on any job.

These modern compressor units will save you time, labor and overhead expense.

60, 105, 160, 210, 315 cu. ft. ACTUAL CAPACITY



Truck mounting



Skid mounting



4-wheel spring trailer

Worthington rock drills, breakers, drivers, diggers and tampers are further aids to profitable operation.



There's a Worthington Dealer near you

WORTHINGTON PUMP AND MACHINERY CORPORATION  
General Offices: HARRISON, NEW JERSEY  
District Offices and Dealers in Principal Cities

# WORTHINGTON

## South Texas Bridge Progresses Rapidly

The substructure for the Neches River Bridge near Port Arthur has been completed and the superstructure will be completed for the opening of the bridge by June 1, 1937. Erection of the superstructure by the Taylor-Fichter Steel Construction Co., of New York, holder of the \$1,613,500 contract, started in January this year.

The photograph shows a row of pedestal piers along the south approach to the bridge. Derrick barges and other equipment for the construction of these piers were floated along an artificial canal adjacent to the line of the bridge. Concrete for the pedestal piers was hauled in buckets on barges from a central mixing plant on the river proper and lifted into the forms by the floating derricks.

By mid December, 35 of the 68 piers had been completed. They rest on a foundation of untreated timber piling and the bottoms of the pedestals are 4 to 5 feet below mean Gulf level, while the tops are 11 feet higher, placing the steel columns above extreme floods and the damp condition of the low marshy area. The piers are 50 feet wide,  $4\frac{1}{2}$  feet square at the top of the pedestal and carry steel towers varying in height from 20 to 80 feet.

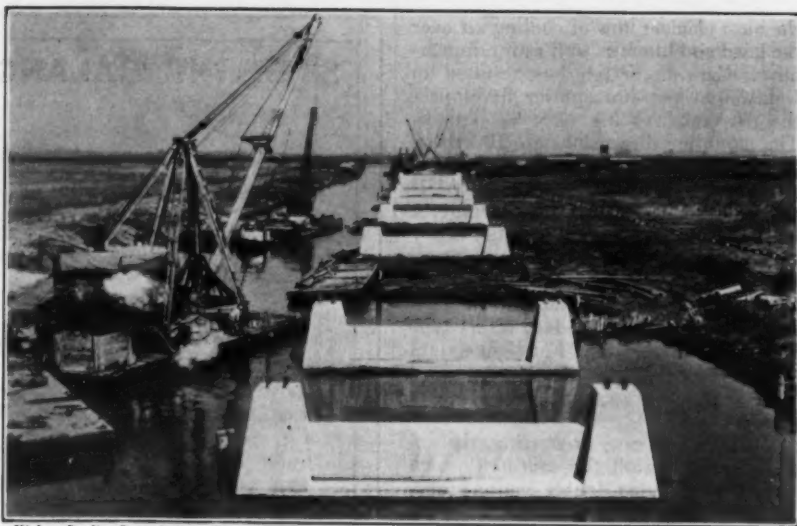
When completed, the main span of the bridge will have a vertical clearance of 176 feet above average water level, while the horizontal clearance of the main span between protection fenders will be 600 feet.

## Asphalt Bond Improved On Corrugated Metal Pipe

Paved invert pipe for culverts and sewers has been used for many years. Fully coated corrugated metal pipe followed soon after for complete protection under the most severe conditions. Now the Armco Culvert Mfrs. Assn., Middletown, Ohio, announces the result of research and time tests of asbestos bonding of the asphalt lining with the zinc of the protective galvanizing.

The latest bulletin of the Association describes the special process in some detail. As the flat sheets of Armco ingot iron emerge from the galvanizing rolls, a layer of asbestos felt is forced into the molten zinc coating under a pressure of several thousand pounds. Thus, when the zinc hardens, a portion of each asbestos fibre becomes embedded in the zinc. Next, the porous mass of fibres remaining on the surface of the sheet is thoroughly saturated with a special bituminous material. The sheets are then allowed to cool after which they are corrugated and inspected.

This new bonding increases the plastic range of the bituminous material which may be used for coating by as much as 52 per cent. The old range was from 32 degrees to 150 degrees F. while the new range is from 0 to 180 degrees F. This provides an additional



Hickey Studio, Port Arthur, Texas

A Row of Pedestal Piers Along the South Approach to the Neches River Bridge

factor of safety, especially where the pipe must be stored or handled during

extreme variations in temperature, assuring that the coating and pavement of the

pipe will remain intact in actual service. To prove the ability of bituminous material to resist shock in cold weather, a coated half section of asbestos bonded pipe was placed inside a refrigerator and frozen to zero. A solid steel ball, weighing 1.67 pounds, was then dropped onto the frozen sample from a height of  $7\frac{1}{2}$  feet, but there was no spalling or cracking of the bituminous material on the inside of the specimen. As a further test, a paved and coated specimen was placed upright in an electric furnace and left in that position for 4 hours, at a temperature of 180 degrees F. At the end of this period even the thick bituminous pavement had flowed less than one quarter inch. Copies of the bulletin "Asbestos Bonding" describing this latest improvement in coated corrugated pipe will be furnished by the Armco Culvert Mfrs. Assn., on request.

Costa Rica is planning the construction of roads to the summits of the two highest volcanoes on the Central Plateau.

## HERCULES-POWERED PAVERS SURFACE 35 MILES OF EVANSTON STREETS

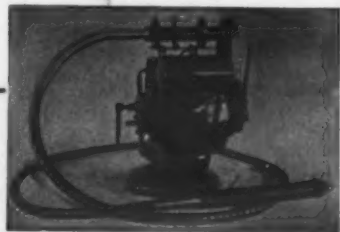


Last summer, the Arcole Construction Company of Chicago resurfaced 35 miles of old macadam and brick pavements in Evanston, Illinois. The new asphaltic surface was laid by three Hercules-powered Adnun Black Top Pavers, which together laid as much as 1,000 tons of pavement a day. Another example of the numerous and varied ways Hercules Engines serve industry! Many leading

manufacturers of industrial machinery—including pavers, shovels, ditchers, dredges, pumps, rollers, air compressors, concrete mixers, tractors and trucks—standardize on Hercules Power. The efficiency and dependability of Hercules Engines—both gasoline and Diesel—result from more than twenty years of specialized experience in building internal-combustion engines for heavy-duty equipment.

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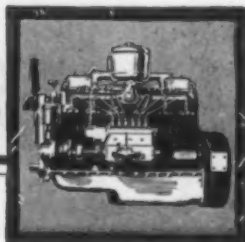


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# HERCULES ENGINES



### Resumé of Road Work In Colorado in 1936

During 1936, the heaviest volume of highway construction in the history of the Colorado State Highway Department was carried on, involving a total expenditure of \$20,544,100 and covering work on 1,585.6 miles of road.

Among these projects were some carried over from 1935 and finished last year. These included one 3-mile grading job costing \$140,000; thirty-one gravel surfacing projects totaling 158

miles and costing \$3,019,000; three oil-processing projects, 0.3-mile, costing \$209,000; and four concrete paving jobs, 0.3-mile in length, amounting to \$535,500.

Projects contracted for and finished in 1936 include seventy-eight surfacing projects, totaling 244 miles and costing \$5,371,000; sixty-four oil-processing jobs, 696 miles and amounting to \$1,500,000; four concrete paving jobs, totaling 10 miles in length and costing \$615,000; and two landscaping projects, 2 miles in length, which cost

\$14,000.

A number of projects were started last year which have been carried over into this year and include one 1-mile grading job, to cost \$49,200; eighty gravel surfacing projects, totaling 447 miles and amounting to \$7,985,400; four concrete paving jobs, a total of 21 miles, to cost \$1,085,000; and two landscaping projects, of 3 miles in length, which will cost \$21,000.

The mileage of improvement actually accomplished during 1936 is estimated as follows:

Graded projects.....	4 miles
Gravel surfaced projects.....	448 miles
Oil-processed projects.....	697 miles
Concrete pavement.....	12 miles
Total .....	1,161 miles

These figures also include the elimination of forty-five railroad grade crossings, ten overpasses, four underpasses and thirty-one relocations. There are also included all the bridge projects, distributed to the type of road to which the bridges belong. A total of 279 bridges, involving a total length of 33,026 linear feet or 6.25 miles, is a part of the above projects.

THE BARRETT COMPANY New York Chicago Philadelphia Birmingham St. Louis Rochester Toledo Milwaukee Detroit  
Baltimore Youngstown Cincinnati Buffalo Minneapolis Syracuse Bethlehem Providence Cleveland Hartford Portland, Me.  
Lebanon Columbus Boston Norwood, N. Y. In Canada: THE BARRETT COMPANY, LTD. Montreal Toronto Winnipeg Vancouver

## Road-Mix Repair In New Mexico

**Damaged Oil Mat Rebuilt By  
Reprocessing on Road by State  
Maintenance Crew**

THE oil-mat surface on the Albuquerque-Socorro road south of the first-named city was built as FAP 125-C in 1930. Some sections of this road are now in need of repair as the traffic has increased greatly in numbers and weight. The state maintenance forces have developed a method of maintenance by renewal of the worn material which has proved successful and low in cost.

The 3-inch oil-mat top is scarified for the full depth of the mat and bladed in a windrow to one side. When a sufficient amount of material is ready to be treated, the windrow is spread 10 feet wide on the roadway and shot with about 1/2-gallon of MC-3 oil, a medium-cure oil of 75 to 80 per cent asphalt cut back with kerosene. This material is at present furnished by the Col-Tex Oil Co., of Colorado, Texas. The oil is heated to 200 degrees at the 10,400-gallon storage tank in the district and then drawn off to the 1,200-tank of the Gilmore distributor mounted on an FWD chassis.

As soon as a stretch of the roadway material has been shot with the oil, it is disked to pulverize the balls that may exist and to mix the material. This is followed immediately by blading from side to side with the two Caterpillar No. 11 patrol graders, one with gas and the other with diesel power. The material is moved back and forth across the road for five to seven times until it is homogeneous. On long runs the graders turn at the ends and run forward at all times. When the runs are short, one grader runs forward making a cut and then backs to the starting end while the other grader continues the cut, running forward and backing to its starting end.

When thoroughly mixed the material is spread the full 20-foot width of the roadway and allowed to set for 12 to 24 hours after which it is rolled with a Buffalo-Springfield 5-ton tandem roller. If rolling is started immediately after spreading, the material creeps under the roller and breaks at the edges. Rolling is done at 3 1/2 miles per hour.

The roadway thus repaired is sealed one to three months later with an appli-



C. & E. M. Photo

A No. 11 Patrol Grader Reprocessing a State Highway Near Albuquerque

cation of RC-3 oil, a rapid-cure oil of the same asphalt content, and cut back with naphtha instead of oil, at the rate of 1/12-gallon per square yard.

### Cost of Reprocessing

This maintenance, which is well

named "reprocessing," is done at the rate of about 1 1/2 days for a 1/4-mile length of 20-foot road. Longer stretches of surface can be done in shorter unit periods as the time lost in turning the graders is greatly reduced. The cost of the work is from \$200 to \$300 per mile

of 20-foot roadway.

The work of maintenance described, in District No. 3 of the New Mexico State Highway Department with headquarters at Albuquerque, N.M., is in charge of H. A. Oldfield, Asphalt Foreman, under the direction of Gordon Sumner, District Engineer. This district has a total of 1,011.5 miles of highway under its maintenance of which 226.4 miles are oil-mat surfacing.

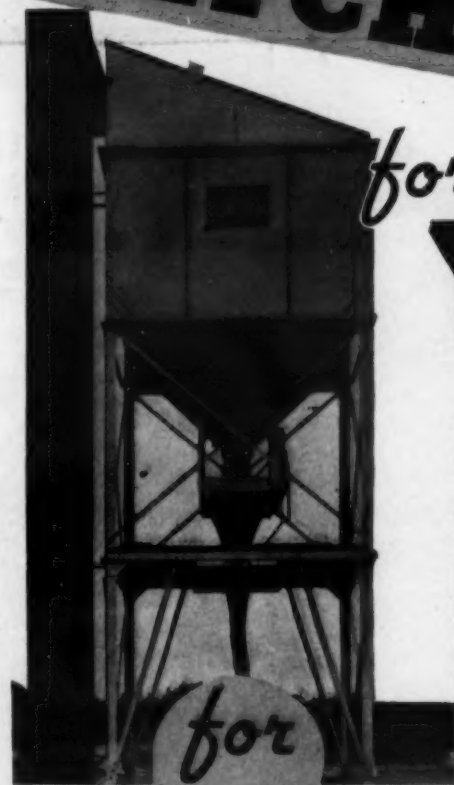
### Booklet on New Clamshell

The new Hayward clamshell bucket Class E-16, which has a number of new and interesting features, is described in a new bulletin just issued by the Hayward Co., 32-36 Dey St., New York City. This bulletin also contains a chart giving full specifications and load capacities for various materials for which this bucket is intended.

Copies of this Bulletin 660 may be secured free by writing to the Hayward Co. at the above address.

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BLAW-KNOX BULK CEMENT PLANTS are complete, including portable bins of various sizes; manual or automatic Weighing Batchers with beam scales or dial scales to meet all specification needs; cement elevators with gas engine or electric power; unloading equipment for hopper bottom car, box car, or truck delivery.



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Diesel Draglines  
775 P & H Diesel Draglines

pumps, compressors, lighting plants, tractors, shovels, pile driving outfits, concrete mixers, scales, Inley concrete placing outfit, concrete heaters and vibrators, gravel screening plants, compressed air drill sharpeners, shop equipment, gasoline powered hoists with and without skips, bar benders and cutters, carbide floodlights and other items at bargain prices. Wire or write for complete list and prices

R. L. Harrison Co. Inc.  
Albuquerque New Mexico

## Oregon Cut-Off Built By Stage Construction

(Continued from page 15)

The plant consisted of a 15 x 38-inch jaw crusher operated by a PD-40 International diesel engine and an 8-inch gyratory crusher was operated by a second engine of the same size. The re-crusher consisting of a set of 40 x 20-inch rollers was operated by a 100-hp diesel. Another PD-40 International diesel power unit operated a 50-kw generator, which provided power for driving all the conveyors and screens and a compressor through individual motors, and operating a complete lighting system.

### Hauling the Materials

For hauling the crushed stone from the plant to the road a fleet of 11 International motor trucks was used, including three 3½ to 7-ton, six-wheel, dual-drive, two-speed rear-axle trucks equipped with 8-yard bodies and four 1½-ton, two-speed, rear-axle International trucks equipped with 3-yard bodies.

### Personnel

W. H. Lynch is District Engineer for the U. S. Bureau of Public Roads, under whose supervision this work was done, and H. D. Farmer, Senior Highway Engineer in charge of forest highway construction in Oregon. Rex Mack was Resident Engineer.

## New All-Welded Concrete Bucket With Bottom Dump

A new type of all-welded cylindrical concrete bucket, particularly designed for convenience in operation in close forms and for handling low-slump concrete, has been announced by the Dravo Corp., Neville Island Station, Pittsburgh, Pa. This bucket, made in 2, 3 and 4-yard capacities, is a bottom-dump controllable type.

The bucket has no projecting levers and is operated entirely by a hand wheel set into the outer shell. Two wheels are provided on the 4-yard buckets. Besides facilitating the opening of the bucket in cramped quarters, the design provides an added safety feature in that there are no projecting parts to catch on forms, reinforcing steel, or the clothing of the workmen. In operation, the method of mounting the control gate makes the bucket self-closing, and it can be closed readily when only



The New Dravo All-Welded Concrete Bucket, Showing the Control Wheel Set Into the Outer Shell



Spreading Stone on the Salmon River Cut-Off

part of the concrete has been poured.

Following the use of a trial bucket at the Joe Wheeler Dam being constructed by the Tennessee Valley Authority,

seventeen additional buckets were purchased. Since then, buckets have been sold to a number of other users. Operation has been found to be easy, mainte-

nance costs are low as the operating mechanism is protected by shields to prevent its being clogged with concrete. According to the manufacturer, lubrication is practically the only attention required.

Complete information on this new concrete bucket may be secured direct from the manufacturer, Dravo Corp., Neville Island Station, Pittsburgh, Penna., by mentioning this magazine.

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# Austin-Western

## Driving Tooth Rock Tunnel in Ore.

(Continued from page 2)

firing these light charges and the dice-like rock was then easy to handle with a shovel. A few large pieces came from the solid stratum but they were seldom more than a foot in diameter. Another reason for the light charges was the fact that there are a railroad tunnel and tracks almost immediately below the highway tunnel that might have been endangered by heavier charges.

About 2 feet of rock per round was secured and the results of the blasting showed on the average about 1½ tons of rock per pound of explosive. The drills were sharpened in a small plant just outside the east portal, containing one Ingersoll-Rand 44 drill sharpener.

Two plants furnished the compressed air for the operations, one at each end. The larger one, at the east end, consisted of two Ingersoll-Rand Imperial Type 40 compressors housed in a building at the portal. This took care of the east face drilling and, by means of a pipe carried around the rock, was able to supplement the output of a smaller plant at the west end. The latter was a Gardner-Denver gas-driven portable compressor, Model AA Form 2002.

### Ventilation

Considerable dust soon became a menace during drilling, and fumes and smoke had to be removed after each blast in some expeditious manner. A simple but effective blower system was then installed. A B. F. Sturtevant 60-inch blower fan was set up near the east entrance, belted to a 25-hp General Electric motor. An air duct was then constructed of plyboard along the side of the tunnel, having a cross-section about 3 feet square. This was connected with the exhaust of the fan and was extended in length from time to time so that the end would be within effective distance from the face. All fumes and smoke were readily driven out within a few minutes after each blast.

### Mucking

The mucking out operations were performed by a Bucyrus-Erie 10-B shovel with ¾-yard dipper. This busy little machine handled both ends of the tunnel, being hauled around from one end to the other on its own trailer by means of a truck. It worked at one end while the other was being drilled and loaded. When the shots were heard at one end, the little shovel could be counted on to have completed its task at the other, and thereupon a quick transfer was made. The advantage of the miniature shovel was also manifest at the face where, with quick, short swings it was able to load a truck standing directly alongside in the 34-foot wide bore.

### Lighting for Tunnel

A motorist coming from either direction can see Tooth Rock from some distance. When he arrives at the completed tunnel, on a bright, sunny day, he will find it illuminated so brightly that the transition from sunlight to artificial lighting will hardly be noticed and that dangerous momentary blindness will be eliminated. If it should be a dark day, he will find the illumination dimmed. Or if it is in the night, the lighting will be very low and his headlights will come into play. These remarkable lighting effects, which will reduce the hazard of tunnel driving to a minimum, will be produced by an installation of powerful, sodium vapor lamps controlled by an electric eye. Bright outside, bright inside; darker outside, darker inside, is the system, so that the pupils of the eye will not be called upon to do stunts while the driver fearfully hugs the middle of the road.

### Personnel

The Tooth Rock Tunnel contract for the U. S. Bureau of Public Roads is being executed by Orino, Birkemeier & Saremal, of Bonneville, Ore. The amount of the contract is \$225,000. D. H. Cadmus is Resident Engineer for the Bureau.

### New 8-Yard Truck Body

The Easton Model W-84-HX Won-Way truck body, of 8-cubic yard water-level capacity, recently announced by the Easton Car & Construction Co., 10 East 40th St., New York City, has a number of new and interesting features. It is built of heavy-duty high-carbon steel plate, rigidly reinforced with many

heavy section H-beam side stakes and floor supports and H-beam sills running lengthwise. The body end plate is heavily braced and extended upward and outward to provide overhead protection for the driver.

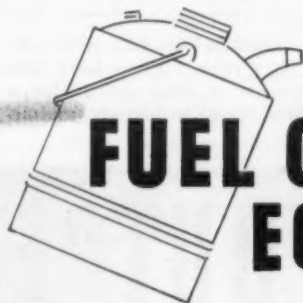
The patented automatic down-folding gate becomes flush with the floor when the body is elevated 16 degrees and thereafter remains flush, providing a chute for whatever material the truck may be carrying. The body is elevated for dumping by a double telescope hydraulic hoist located on the truck chassis. The maximum angle of dump is 50 degrees.

Further details of these Won-Way truck bodies may be secured by those interested direct from the manufacturer by mentioning this magazine.

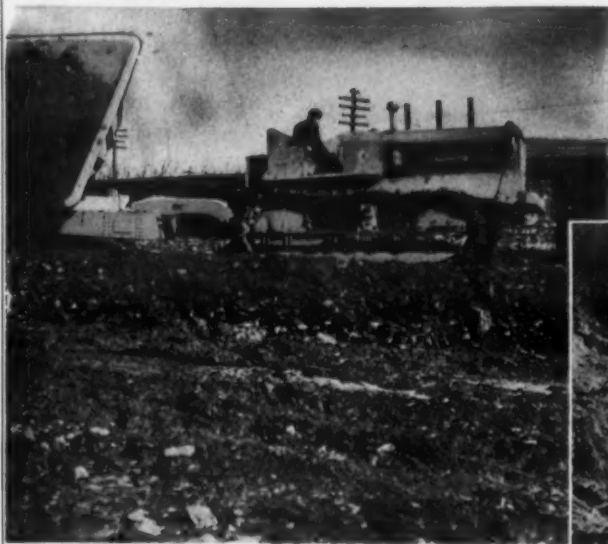
### All-Steel 3-Speed 3-Ton Hand Winch

The Ramsey Machinery Co., 1626 N. W. Thurman St., Portland, Ore., manufacturer of compound-gear hand winches and truck hoists, is now making a 3-ton capacity all-steel 3-speed hand winch. This new model is practically identical in appearance and design to the 5-ton model. The new winch, including the crank, weighs 75 pounds. The drum holds 150 feet of ½-inch cable and the gear ratios are 24, 4 and 1 to 1.

Complete information on this new hand winch may be secured direct from the manufacturer by mentioning this magazine.



Tractor users are finding that fuel economy ALONE is not enough. Allis-Chalmers economy goes farther. In the Controlled Ignition Oil Tractor ... Diesel fuel economy has been COMBINED for the first time with smooth, dependable operation, instant starting, greater simplicity, less dead weight and better balance.



### ROBERTS PAVING COMPANY "REPEATS"

Hauling approximately 12 yards per trip, these Model "L-O" Oil Tractors move big yardage for Roberts Paving Company on their job near Harrisburg, Pa. Shown also is their Model "WK" and bulldozer. After experiencing the economy and dependability of A-C power—this contractor recently ordered two additional "L-O's"

Controlled Ignition eliminates the need for high compression pressures—thereby avoiding vibration, crankshaft whip, terrific heat, excessive wear and strain on working parts—and expensive repairs. No special grades of fuel are necessary ... special lubricating oil is not required ... and there is no auxiliary starting motor. Investigate this improved principle of tractor operation!

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**ALLIS-CHALMERS**  
TRACTOR DIVISION—MILWAUKEE, U. S. A.

### Causes of Road Accidents Studied in Great Britain

The results of a study of the causes of road accidents in the British Isles have been reported through the American Consulate General in London to the U. S. Bureau of Foreign and Domestic Commerce.

Out of a total of 178,000 miles of roads in Britain, 40,500 miles are subject to the 30 miles an hour speed limit. Of the 44,000 miles of classified roads in the country, 10,050 miles are subject to the speed limit while of the 134,000 miles of unclassified roads, 30,450 miles are restricted. The number of pedestrian crossing places in the London Traffic Area is approximately 11,550,

and in England and Wales, there are 12,486.

In an analysis of the contributory causes of 760 accidents, it was found that 246 were due to slippery road surfaces or worn paving blocks; 266 to blind corners and bad visibility; 64 to road surface in bad repair; 60 to defective shape of carriageways; 66 to street-car tracks, pavings, etc.; and 46 to difficult bends. In London, 438 cases were investigated, in 30 of which the road conditions were not contributory. Of the others, the alleged contributory causes included 51 due to bad road surfaces; 39 to dangerous corners; 28 to skidding; 20 to slipping on pedestrian crossing studs; 47 to defective lighting; and 70 to collision with obstacles on the footway.

### The Road Shoulder As a Safety Factor

The shoulder of a highway should be wide enough to permit parking off the traveled surface, to permit escape from a wild car and to permit the escape of a wild car itself. Narrow shoulders are a definite hazard. The minimum shoulder should be equal to one traffic lane.

Next to the shoulder, there should be a flat slope to the ditch. Make the slope long to get the depth if needed. By flat slope we mean not less than 4 to 1, with the ditch no deeper than is necessary. Keep trees off the shoulders and out of the ditches as they are a hazard anywhere near the highway and the road shoulder safety zone.

### New Lab. Building of Nevada Hwy. Dept.

(Continued from page 11)

for breaking or bending steel bars. There are two moist boxes in use for immersing concrete briquettes, some for seven days and others for 28 days before testing them in the Fairbanks-Morse concrete briquette breaking machine. There is a Vicat machine for testing the normal consistency of cement, five tests being made on each cement sample submitted. A torsion balance scale is also used in the testing laboratory. A Watson-Stillman press, with a pressure capacity of 200,000 pounds, is used for testing the compressive strength of concrete cylinders.

Two Ro-Tap machines are used for thoroughly mixing sand, in making the grading analysis of sand. All sand samples undergo this test for standards. In the Screen Lab there are the various apparatus for making chemical analyses of all oil samples, screen analyses, and a swell test, an agitating machine for mixing oil samples, a compression machine in which 2 x 4-inch cylinders of sand and laboratory cement are tested for tensile strength, an air filter for soil tests in obtaining a clear fluid after soil mixing, an International centrifuge for moisture absorption tests, a centrifuge machine for testing all oils and paints, a unit for making a water-oil preferential test on asphalt material, and an abrasion machine, operating for 1,000 revolutions, for tests for rock wearing.

A muffle furnace, which will develop 1,800 degrees F., or a temperature greater than the melting point of platinum, is used for high temperature tests. There is also an electric oven for drying samples, a penetrometer for determining the consistency of asphalt up to a standard of 80 penetration, a Saybolt standard viscosimeter, an oil condenser for testing thin oils, a road-mix oil extractor in which oil is forced through Carborundum stone and filter paper, and a ductility machine for testing asphaltic materials. The furnace and oven cells are equipped with fume guards and hoods.

The Balance Room, which is separated from the main laboratory, is 9 x 5½ feet in size. In this room are kept the two analytical balances, one of which is the keyboard type, and is used for weighing pigments for paints, crucibles and chemicals; one Bosch & Lomb wide-field double-objective binocular microscope, used for examining minerals, rock, coarse structures of concrete and other road materials; a Bosch & Lomb Universal microscope and accessories, with an illuminating attachment, for examining finer materials; and one Barnstead water still with a capacity of distilling one gallon of water an hour. In addition, the laboratory is equipped with a practical assortment of chemicals kept in a Leonard Peterson chemical case. The top of the case is used as a work table and is liberally supplied with gas and water outlets.

Additional equipment includes one combustion train with rheostat and transformer for the control of current, a fused quartz combustion tube for use in the determination of carbon content of steel submitted for tests, and one constant temperature oven for asphaltic tests.

The chemical laboratory is equipped with ventilators and air-conditioning facilities, vacuum and compressed air outlets and gas and electric hot plates. Fume guards and hoods are placed where necessary for protection.

See that your state gets into step in the march against the highway enemy—gas tax diversion.

# INSTANT STARTING.. LOW MAINTENANCE



Controlled Ignition OIL TRACTORS

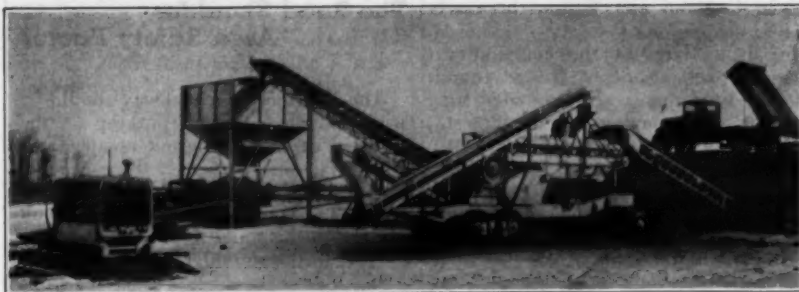
### Canadian County Engineer Outlines Safety Work

Our good neighbor on the north, the Dominion of Canada, is also struggling with the problem of how to cut down on the increasing number of automobile accidents. In his annual report for the work in his county in 1935, Major Hugh A. Lumsden, County Engineer and Road Superintendent in Wentworth County, Ontario, outlined the work in that county to increase the safety of its roads.

The county has erected signboards pointing out road intersections at each and every road. They have a large number of signs indicating curves, jogs in the road, approach to schools, cautions at particularly dangerous hills, etc. They are annually widening the subgrades and endeavoring to eliminate deep and dangerous ditches. They have erected miles of post protection, much of it with cable or highway guard rail. Many checkerboard signs with red reflectors in the center have been erected where sudden turns occur. In grading they are trying to make the road section such that cars can drive into the ditch and out again without damage. In winter they place chips or sand on dangerously slippery sections of the road.

Such work should not only be continued but also improved upon, said Major Lumsden in his report. The rounding of corners to provide a clear view of approaching traffic should be continued. Foot paths should be provided along all roads that carry a pedestrian traffic. The elimination of not only railway crossings but also of intersections of heavily traveled roads is also most desirable. The installation of stop lights, the placing of traffic circles, the lighting of roads, are all subjects requiring a more careful study and adoption where necessary and as finances permit, to provide safe roads for the future.

The first state in the Union to have a gasoline tax to provide revenue for highway financing was Oregon which imposed such a tax on February 25, 1919. New Mexico, Colorado and North Dakota also enacted state gasoline tax legislation to finance highways in 1919. By 1929 every state had a gasoline tax law, with New York the last to pass such legislation.



The New Iowa Super Tandem Crushing and Screening Plant

### New Tandem Crushing And Screening Plant

A new style of tandem crushing and screening plant has been announced by the Iowa Mfg. Co., Cedar Rapids, Iowa. This plant has the new Cedar Rapids roller bearing crusher as a primary, another similar unit as the secondary crusher and an Iowa-Symons vibrator screen as the screening unit. Experi-

ence in both rock and gravel has shown this plant to have greater capacity than earlier two-unit plants. The plant is equipped with roller bearings throughout and is mounted on either solid or pneumatic tires as ordered and equipped with either gas or diesel power. A straight or swivel-type feed conveyor is optional.

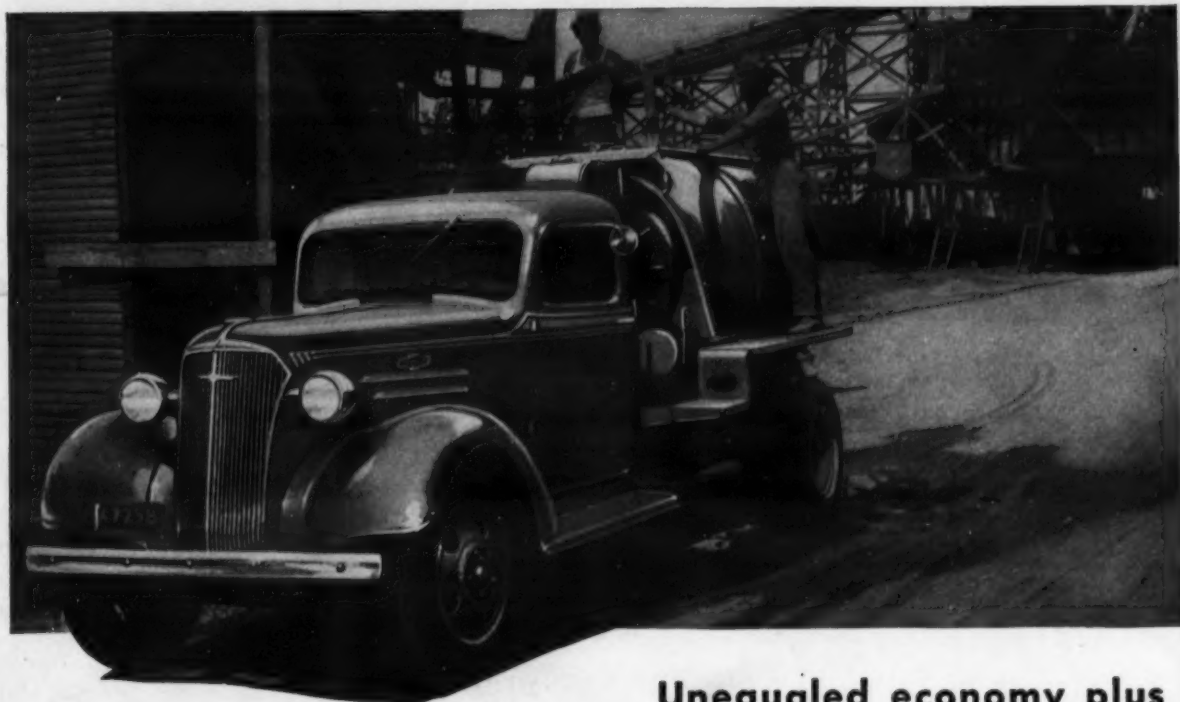
A number of sizes of this plant are available and detailed specifications and photographs may be secured from the

Iowa Mfg. Co., Cedar Rapids, Iowa, in the new Iowa Super Straight-Line Tandem Plant circular. In addition to the Super model the company has announced a complete line of Junior Tandem Models for 1937.

### Mee of Caterpillar Resigns

H. P. Mee, Vice President of Caterpillar Tractor Co., of Peoria, Ill., has resigned in order to devote more of his personal attention to his citrus holdings in California. Mr. Mee, who has been in charge of all sales, service and advertising activities for Caterpillar, joined the C. L. Best Tractor Co., predecessor of the Caterpillar Tractor Co., 17 years ago. When the Best and Holt companies merged, he became Treasurer, then Secretary and Treasurer, and later Vice President and Treasurer. In 1934 he was promoted to Vice President in charge of sales and for the past two years has held the administrative position from which he has just resigned.

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In every other important feature these new trucks excel in the value they give. Load distribution has been improved, giving more economical operation. New Perfected Hydraulic Brakes are unmatched for smoothness, safety and long-wearing economy. An All-Steel Cab provides both safety and comfort for the driver. The frame, rear axle, transmission . . . in fact, every part is built the Chevrolet way: extra-strong, extra-durable and extra-dependable.

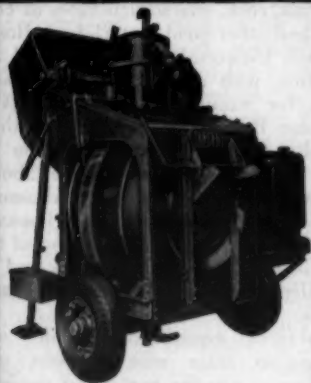
See these new Chevrolet trucks! Ask your Chevrolet dealer for a demonstration on your haulage jobs.

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## JAEGER

## "MORE POWER per gallon LOWER COST per load!"

# 95% OF ALL MODERN CONSTRUCTION MACHINERY IS FACTORY-EQUIPPED FOR *Alemite Lubrication*



## *Alemite System Guards Expensive Bearings On Big Stone Crusher, Elevator, and Screen*

clean lubricant to every part of the bearing surface.

Here's a Pioneer Jaw Crusher, working with a Secondary Roll Crusher, Folding Bucket Elevator, and Horizontal Gradation Screen to make three sizes of crushed limestone on a county project in La Crosse County, Wis. There's flying limestone dust everywhere—*except inside the bearings!*

See how easily, in the small photo, lubricant is applied to the Alemite Fitting with the Alemite Gun! It's the clean, quick, safe method—*used on more than 95% of*

*all modern construction machinery!* Bring your older equipment up to date—safeguard your expensive bearings—and cut down lubricating costs, by replacing oil holes and grease cups with modern Alemite Fittings! This can be done quickly, at small cost, without delaying the job!

Mail the coupon today for your FREE copy of our new manual, "Alemite Controlled Lubrication."

**ALEMITE—A Division of Stewart-Warner Corporation**  
1850 Diversey Parkway Chicago, Illinois

Stewart-Warner-Alemite Corporation of Canada, Ltd.  
Belleville, Ontario, Canada

IT doesn't take much grit—in a bearing that's carrying tons of pressure—to ruin that bearing in short order. That's why Pioneer Gravel Equipment Mfg. Co. puts Alemite Fittings on *every* bearing on *every* piece of Pioneer construction machinery. Because they know these fittings are sealed against dust and grit, opening only under the pressure of Alemite Guns to admit

Enjoy Horace Heidt and his Alemite Brigadiers every Monday evening, over Columbia Coast-to-Coast Network. See local papers for time of broadcast

# ALEMITE

REG. U. S. PAT. OFF.

**WORLD'S LARGEST MANUFACTURERS OF  
LUBRICATING PRODUCTS**

**ALEMITE—A Division of Stewart-Warner Corp'n. Dept. D**  
1850 Diversey Parkway, Chicago, Illinois  
Please send your new manual, "Alemite Controlled Lubrication."

Name \_\_\_\_\_ State \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_  
Firm Name \_\_\_\_\_



The New Dietz No. 87  
Highway Flare

### New Highway Flare

A new highway flare, known as No. 87, of the self-righting spherical type, has been added to its line of highway flare torches by the R. E. Dietz Co., 60 Lighthouse St., New York City. This new flare, made of steel with a double-seamed leakproof joint, has a weighted bottom and is fitted with a carrying ring. It is equipped with a new, efficient windproof burner with a fixed rain shield, fully licensed. The wick is held by a spiral wick feed which prevents the wick from dropping.

The fuel used is kerosene or light fuel oil, operating with 7/8-inch round wick. It has a burning capacity of 24 hours.

### Testing Sieve Shaker With Simple Holder

A new testing sieve shaker for testing fine materials has been announced by the Newark Wire Cloth Co., Newark, N. J. This shaker is provided with a simplified hold-down device which permits the sieves to be put in place or removed easily and quickly, regardless of the number of sieves used.

The methods employed and recommended by the U. S. Bureau of Standards in making standard cement tests were followed in designing this shaker. The Bureau method recommends about 150 strokes per minute and revolving the sieves approximately one revolution per minute. In this manner no strenuous motion is applied to the sieve, simply a light tap at the end of each stroke by the free hand. This allows the material being tested to roll over the sieve cloth, keeping it in constant contact and giving it every possible opportunity to find an aperture.

The Newark End-Shak machine holds a nest of sieves and reciprocates them in a direction lengthwise of the gear box. The mechanism is entirely enclosed and operates while submerged in oil, eliminating much wear and tear and effectively muffling noises. The entire machine weighs 145 pounds, including the motor and auto time switch. It stands 32 inches high and the base measures 22 x 18 inches. A standard 1/4-hp motor is used, with either 110 or 220-volts on 60-cycle alternating current, operating at

1,750 rpm. The End-Shak machine is designed for 8-inch diameter standard testing sieves and is adjustable to hold from 1 to 13 sieves.

### New P.C.A. Appointments

The appointments of A. M. Davis as District Engineer of the Portland Cement Association Michigan office with headquarters at Lansing, of A. W. Rohlwing as District Engineer in charge of its work in Indiana and Kentucky with headquarters at Indianapolis, and of A. F. Unckrich as District Engineer in charge of its Columbus office with supervision over the work in Ohio and West Virginia have just been announced by the Portland Cement Association.

Mr. Davis, who has been with the Association since 1928, has been for the past two years Chief Field Engineer in Michigan. Mr. Rohlwing who has been with the Association since 1927 and since 1936 has been Structural Field Engineer for the Indianapolis office, replaces H. J. McDargh, recently ap-

pointed Regional Manager of the southeastern offices with headquarters at Atlanta. Mr. Unckrich has been a

member of the Association staff for the past 13 years and since 1934 has been Chief Field Engineer in Ohio.

### GAIN GREATER PROFITS FROM SMALL JOBS!

#### FASTER TOWING

Because it has automotive type springs and pneumatic tires.

#### EASIER SPOTTING

Because it is lighter weight and more finely balanced.

#### BETTER MIXING

Because it has the Rex mixing action that cuts the batch 21 more times a minute.

Other Rex Mixers from 5-S to 14-S—

Write for our 1937 Mixer Bulletins!

CHAIN BELT COMPANY

1666 West Bruce Street, Milwaukee, Wisconsin



Rex  
3 1/2-S  
TILTER

**REX**

CHAIN BELT COMPANY OF MILWAUKEE  
CONSTRUCTION EQUIPMENT



In your industry—in every industry—profit-minded truck buyers are looking to GMC for extra value. Whatever your hauling needs may be, whether you require a half-ton or a 12-ton truck or a tractor with trailer, you'll find in the unusually complete GMC line a "truck-built" vehicle with the proved ability to perform ably and save money. There are both standard and cab-over-

engine types ranging in capacity up to 12 tons. And, of vital importance, every GMC has advanced stream-style and exclusive "dual-tone" color design that assure exceptionally distinctive appearance. Get the facts! See GMC for extra value!

QUALITY AT PRICES  
LOWER THAN AVERAGE

Time payments through our own Y. M. A. C. Plan at lowest available rates

**GENERAL MOTORS TRUCKS & TRAILERS**

GENERAL MOTORS TRUCK & COACH

DIVISION OF  
YELLOW TRUCK & COACH MANUFACTURING COMPANY, FORT LEE, MICHIGAN



The End-Shak Machine For  
Testing Sieves



Grover, Diggs and Halsey Examine a G-E Highway Lighting Unit

## Hwy. Officials See Light For Night Accident Areas

A G-E high-visibility incandescent light for installation along night-accident areas on main highways was shown to the Association of Highway Officials of the North Atlantic States at its annual convention in New York City on February 25. Equipped with a terraced reflector and a 4,000-lumen bar-filament lamp, the unit resembles an admiral's hat in shape. When these units are spaced at 125-foot intervals, they give an even pavement brightness free from dark areas and reveal objects as silhouettes. Along straight stretches lighted by the new lights, obstacles can be seen up to a half-mile ahead of the motorist, it is said.

The accompanying illustration shows A. Lee Grover, Secretary of the Association, at the left; Dudley M. Diggs, General Electric engineer, in the center holding the high-visibility unit; and at the right, Maxwell Halsey, Assistant Director of the Bureau of Street Traffic Research at Harvard University.

## A Convertible Vibrator For Roadway Concrete

In addition to its flexible-shaft-drive internal concrete vibrators, the Baily Vibrator Co. offers a small, one-man portable vibrator called the Wolloper, designed for vibrating concrete road joints, longitudinal edges, road patches, curbs, sidewalks, floors and electric railway track concrete slabs in any thickness up to 10 inches. For internal vibration, the four sturdy fingers are immersed in the concrete. For surface vibration the fingers are removed and one or two float pads attached.

The operating weight of this one-man tool is 60 pounds. The vibration frequency is from 3,600 to 5,000 per minute and adjustable out-of-balance weights permit any desired intensity of action. It is a self-contained unit with no flexible shafts, no air compressor, and no electric power. A 4-cycle air-cooled gasoline engine running 8 hours on a gallon of gasoline and having hand speed control drives the unit. Patented absorbers eliminate transmission of vibrations to the engine and to the operator's hands. The vibrator shaft has grease-sealed ball bearings which are



The Baily Vibrator With Its Four Fingers for Internal Vibration of Concrete

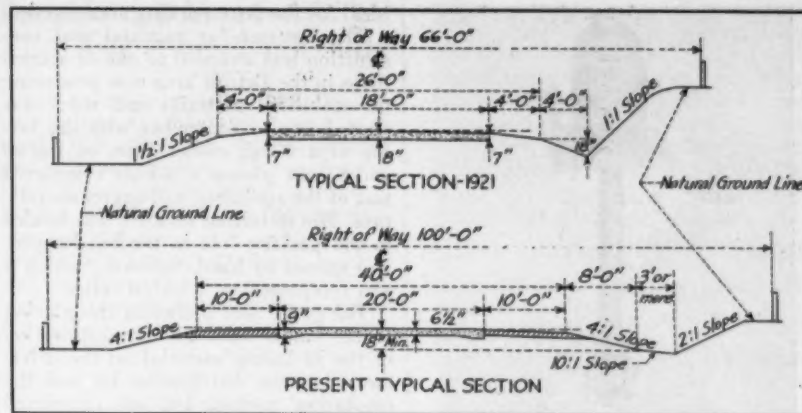
"lubricated-for-life". These vibrators are made by the Baily Vibrator Co., 1526 Wood Street, Philadelphia, Pa.

## Excavation Increases Per Mile of Highway

(Continued from page 1)

### But Prices Decrease

Fortunately, with the number of units handled in building a mile of highway steadily increasing, the price at which these units have been handled has generally decreased, with the result that the cost of constructing a mile of highway, though showing some upward trend, has been comparatively uniform. Unit prices for work today are approximately 50 per cent of the 1923 average and approximately 25 per cent below the 1925-1929 average. The cost per mile of highway is approximately 15 per cent above the 1925-1929 average, whereas the number of units handled averages ap-



Cross Sections Showing Improvement in Highways Since 1921

proximately 50 per cent above the 1925-1929 average.

### And Why

There are probably a great many factors responsible for this unit price and cost trend. Principal among these are

the improvements in efficiency for performing the work, which to a large degree have been made possible by the development and use of mechanical equipment, processes and devices.

From a paper presented at the Tractor and Industrial Power Equipment Meeting of the Society of Automotive Engineers at Milwaukee, Wis.

# THE EXTRA ADVANTAGES of the NEW LITTLEFORD MODEL "C" DISTRIBUTOR



THE SINGLE VALVE on the Littleford Model "C" Pressure Distributor cuts off sprays instantly—without dribbling. By flipping the control handwheel over one quarter turn, the suction of the pump sucks back into the tank all material in the lines and spray bar. A neat cut-off without using a valve on every nozzle.

Instant Cut-Off without Dribbling

Faster Heating with Low Pressure Burner—Continuous Heat Flue

Single Valve Control with "suck back" feature



## The Solution of Modern Maintenance Problems . . .



### Emulsion and Cut-Back Sprayers

A complete line of small Littleford sprayers that operate with compressed air in one or two drum sizes with or without heating provisions is made. Use one of these handy efficient sprayers for your penetration patching, concrete curing or paint coating for asphaltic repairs. Write, today, for information.

### The Littleford No. 1 Sprayer

This big, fast heating, motor driven pump type bituminous road maintenance outfit will handle any type of material and do all your patching, shoulder maintenance and a lot of minor construction work. Ask for latest prices and data.



**LITTLEFORD**  
Road Maintenance Equipment  
SINCE 1900

LITTLEFORD BROS., 485 E. PEARL ST. CINCINNATI, O.





One of the Freflo Pumps for Underpass Drainage

### Underpass Drainage

A new application of Freflo centrifugal pumps to underpass drainage has been announced by the Worthington Pump & Machinery Corp., Harrison, N. J. These pumps can handle waste water economically, pumping directly from the catch basin and requiring only an inexpensive housing and a sump or catch basin.

These centrifugals are made in capacities of 85 to 7,500 gallons a minute, are simple to operate, and can be equipped for automatic starting and stopping. Features of these pumps are the flared suction inlet to reduce entrance losses; the free passages through the impeller and casing; and the ball thrust bearing of ample size to carry the thrust load. They are built ready to install, with the foundation plate and driving head frame of heavy fabricated steel supporting the entire weight of the pump and driver.

A descriptive bulletin, W-317-B5, may be secured direct from the manufacturer by mentioning this magazine.

### Surfacing Parking Areas At Big Automobile Plant

A division of one of America's major automobile corporations recently moved into its new plant in Detroit. After extensive alterations to the existing factory buildings and the erection of a new, completely modern assembly plant, company engineers found it necessary to create suitable parking areas for finished automobiles awaiting shipment and for the cars of employees.

Investigation was made of stabilized soil-aggregate streets in Detroit, of which some 50 miles have been built in the past year, and it was decided that this low-cost type of surfacing would be

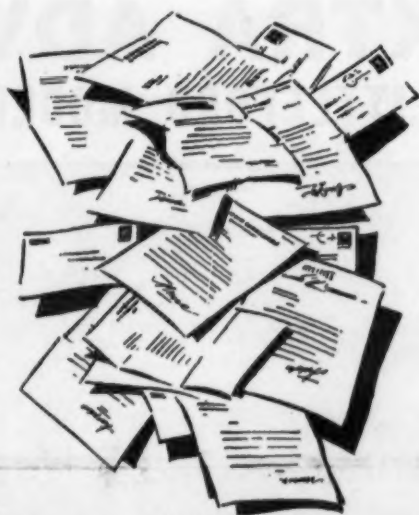
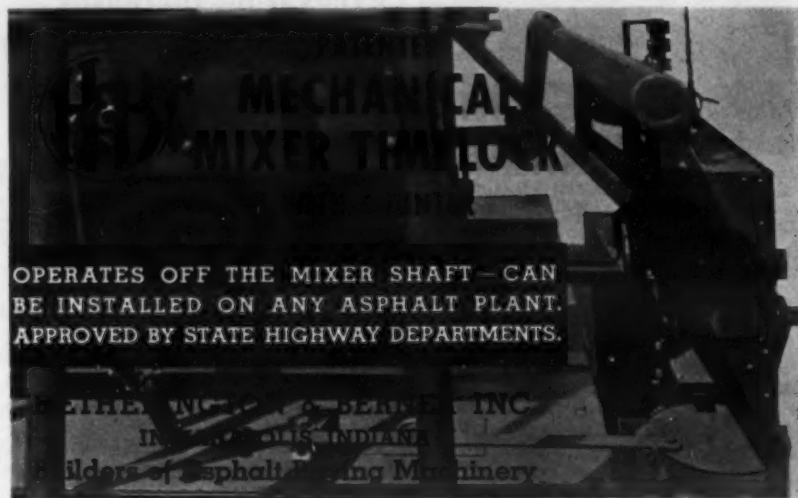
ideal for the three parking areas needed.

The contract for material and construction was awarded to one of several firms in the Detroit area now producing the stabilized material and work was started late in September with the laying of a 4-inch cinder base, on top of which was placed a 4-inch compacted mat of the stabilized soil-aggregate mixture. The stabilized mixture was hauled to the parking lots in trucks, dumped, and spread by hand, following which it was compacted by a 10-ton roller.

The entire job, including the placing of the cinder base and the application of the surfacing material on the drive-away lot, the distribution lot and the employees' parking lot, was completed in less than 30 days. The drive-away lot has an area of 110,000 square feet, the distribution lot an area of 128,000 square feet and the employees' parking lot, 153,000 square feet. All three lots were put to use immediately upon completion. The cost of construction, including the materials for both base and surface courses, was but a fraction of what

it would have been if concrete had been used. It is expected that the cost of maintenance will be slight, since occasional

light surface applications of calcium chloride will keep the areas dustless and hard.



## CONTRACTORS WHO WATCH THEIR HAULING COSTS SAY:

**"FORD ENGINE AND PARTS EXCHANGE PLAN CUTS MAINTENANCE EXPENSE"**



### RECONDITIONED PARTS AVAILABLE AT LOW COST

Carburetor Assemblies	Distributor Assemblies
Fuel Pump Assemblies	Clutch Pressure Plate Assemblies
Generator Assemblies	Clutch Disc Assemblies
Generator Armatures	Brake Shoe Assemblies
Shock Absorbers for Commercial Cars Only	

Low gas and oil costs are only a part of Ford V-8 Truck and Commercial Car economy. Maintenance expense is also low because sound design, quality materials and precision manufacture make trips to the repair shop few and far between.

When parts replacements do become necessary, the cost is small. For example, after tens of thousands of miles of service the V-8 engine can be exchanged for a factory-reconditioned engine at a cost much lower than an ordinary engine overhaul. This exchange can be made in just a few hours, reducing the idle time of the unit. This plan restores original performance and greatly lengthens the useful life of the entire vehicle. In addition to the engine, many other factory-reconditioned parts are available at low cost.

Before you buy any new truck this year, ask your Ford dealer for details about this money-saving plan. Set a date for an "on-the-job" test of a Ford V-8 Truck or Commercial Car under your own operating conditions.



Convenient, economical terms through the Authorized Ford Finance Plans of the Universal Credit Company

# FORD V-8 TRUCKS and commercial cars

**LANSING 3-1/2 MIXER**

FOR FAST TRAILING FAST MIXING

Large mixing drum, Hyatt roller bearing wheels. Wide-tread rubber wheels and spring shock-absorbers. Alemite fittings. Lawson 2 h.p. gasoline engine. WRITE—for specifications and current prices.

**LANSING COMPANY**

LANSING, MICHIGAN

Chicago New York Philadelphia Kansas City San Francisco Boston Minneapolis



The New Buckeye Model 50 Clipper

## New Line of Excavators

A line of  $\frac{1}{2}$ ,  $\frac{3}{8}$  and  $\frac{3}{4}$ -yard excavators, with shovel, crane, dragline, clam-shell and trench hoe attachments, and known as Buckeye Clippers, Models 50, 60 and 70, has been announced by the Buckeye Traction Ditcher Co., Findlay, Ohio.

All operations are controlled, by metered vacuum, from a simple control panel, where small levers move easily at the touch of the operator's fingers. Developed especially for use on the Buckeye Clipper, this metered vacuum control is claimed by the manufacturer to be free from trouble due to extremes of temperature, small leaks, or water in the lines. Automatic vacuum-controlled brakes are designed to add to the efficiency of operation.

Modern engineering and design are other outstanding characteristics of these new machines, featuring the use of 100 per cent electric alloy steels, anti-friction bearings, heat-treated shafting, etc., used throughout to produce an excavator designed for modern, fast, efficient operation. A tubular dipper stick, combining strength and flexibility with moderate weight, and a streamlined cab are other features.

Evidence of consideration for the comfort of the operator is found in the comfortable air-cushioned seat, a convenient rack for tools, and a handy compartment for personal articles. The cab is heated in cold weather by a hot water heater, supplied as standard equipment.

Complete details on these new Buckeye Clippers may be secured direct from the manufacturer by mentioning this magazine.

## N. J. First State to Enact A "Public Roads Act," 1890

Improved road building began prior to 1650 in New Jersey, but there were few wheeled vehicles before 1725 and the first state route from Philadelphia to New York crossing the State of New Jersey was established in 1738, though wagon trains had traveled the route regularly before that time. Up to 1750, the trip required from 5 to 7 days, but after this the time was cut somewhat barring unusual delays.

The years from 1800 to 1825, inclusive, are known as the "Era of the Turnpike." A charter for the first of these, the Morris Turnpike, was obtained in 1801. It ran from Elizabeth to the Delaware River. Fifty-four similar charters were granted during this period. The turnpike represented private enterprise, the builder collecting tolls from all those who made use of the road. The collection of tolls became common also in other states, and was not altogether popular. There is a highway in New York State still known as the "Shunpike," having been originally laid out by indignant farmers determined to shun the paralleling turnpike and its toll collectors.

New Jersey was the first State in the union to enact a "Public Roads Act" providing for State aid in the construction of highways. Concurrent with the passage of this act in 1890 there came

the public demand for more and better roads. When in 1916, the Federal Government, through the Bureau of Public Roads made certain financial help for State road building possible, New Jersey had already made a good beginning on a road system. For many years the Federal aid thus provided was a very small part of the amount spent for road building in New Jersey.

In 1918, New Jersey's first Highway Commission of four members was appointed by the Governor, and the Commission in turn appointed the Highway Engineer. In 1926, the Legislature requested the Commission to submit a plan and program for highway building. This was prepared by the Highway Engineer, revised by the Commission and presented to the legislature and enacted in 1927. It called for the expenditure of about \$300,000,000. Only one-half of this program has been completed. In 1935, the work of the Highway Commission was concentrated in the office of a commissioner appointed by the Governor.

## Portable Unit Used for Gas or Electric Welding

For its many welding jobs, the Detroit Edison Co. had a fleet of  $1\frac{1}{2}$ -ton trucks with gas-driven welders mounted on the body platform. The welder and truck costs, plus that of the necessity of having a truck driver and welding operator for each unit, were so high that a search for a lower-cost portable welding unit was started.

The company purchased three P & H 150-ampere portable trailer welders. On these gas-driven units, suitable modifications were made for mounting oxygen and acetylene tanks on each side of the electric welding unit. This addition provided a self-contained unit equipped for both acetylene and electric welding, thus cutting welding costs by an appreciable amount.

All of the welding of the Detroit Edison Co. is now handled by three welding operators, each with his own portable

welder and personal car. The machines are towed by the car to wherever the job may be, and the men are paid on a mileage basis for hauling the welder. This scheme of operation has worked out very satisfactorily, cutting operating costs and in addition reducing the necessary original investment by about 300 per cent.

## HIGH CAPACITY 4" PUMP Self-Cleaning; high suction lift



FIG. 420

MARLOW PUMPS RIDGEWOOD, N. J.

# The Most Complete Line of Mixers in the World!



There's a SMITH MIXER for every size and type of mixing job. And every one is backed by Smith's 37 years leadership in the Construction Industry.

 2 1/2-S MASCOT — handy 2 wheel trailer mixer.	 7-S NON-TILT — 4 wheel, side-discharge mixer.	 14-S NON-TILT — 4 wheel with power loader.	 64-S TILT — 3 yd. Mixer, hydraulic tilt unit.
 3 1/2-S TILT — lightweight 1/2 ton trailer mixer.	 10-S NON-TILT — 4 wheel, side-discharge mixer.	 28-S NON-TILT — 1 yd. Mixer, variable speed drive.	 112-S TILT — 4 yd. size, World's largest mixer.
 5-S NON-TILT — 4 wheel, side-discharge mixer.	 10-S TRAILSMITH — 2-wheel, end-discharge mixer.	 28-S TILT — 1 yd. Mixer, pneumatic tilt unit.	 27-E PAVES — automatic cycle of operations.
 7-S TRAILSMITH — 2-wheel, end-discharge mixer.	 10-S NON-TILT — 4 wheel, end-discharge mixer.	 56-S TILT — 2 yd. Mixer, pneumatic tilt unit.	 27-E TOWER PAVES — mix, lay and place unit.

Speed of operation — thorough mix — dependable service — low maintenance cost — you get all that with SMITH MIXERS. So before you bid or buy — investigate these better mixers. Write for literature.

THE T. L. SMITH COMPANY, 2857 N. 32nd Street, Milwaukee, Wisconsin

# SMITH MIXERS

THE BOULDER DAM MIXERS

## Concrete Guesswork Cut With Simple Sand Test

A new method to determine the amount of free water and absorbed water in sand used in a concrete mixture has been developed by the U.S. Bureau of Public Roads. Using this test, which requires only the use of a small cone lightly tamped with sand, it is easy to produce a condition in which the pore spaces in the sand grains are completely filled with water without any free water adhering to the surfaces of the particles. The moisture present when the sand is in this condition is called the "absorbed" moisture. Any excess over this amount is called "free" moisture. Bureau engineers point out that the test makes possible a much simpler and more accurate method of making allowance in the water added to a batch of concrete for variations in "free" moisture in the sand. The test is useful both in the laboratory and in field control of concrete mixtures.

It is the so-called "free" moisture in concrete mixtures that dilutes and weakens the cement paste. Only a small part of the water used in mixing concrete is needed for complete hydration of the cement. The rest of the water lubricates the mix so that it may be placed uniformly and without difficulty. Free moisture in sand in unknown quantity upsets scientific proportioning.

The test was developed by D. O. Woolf, Associate Materials Engineer in the Bureau of Public Roads. Moist sand containing free water can be shaped into molds by light pressure. Dry sand cannot be molded. After experimenting with cones of many shapes, Mr. Woolf found that sand lightly tamped into an inverted cone with a top diameter of  $1\frac{1}{2}$  inches, a bottom diameter of  $3\frac{1}{2}$  inches and a height of  $2\frac{3}{8}$  inches contains free moisture if it holds its shape when the cone is removed. At the point where the sand slumps upon removal of the cone, free moisture is gone.

Many methods of determining when sand is surface dry have been suggested, but extensive study by the Bureau has shown that most of these methods are either likely to be inaccurate or so delicate that their use in routine testing is not warranted. The cone test has been adopted by the American Association of State Highway Officials.

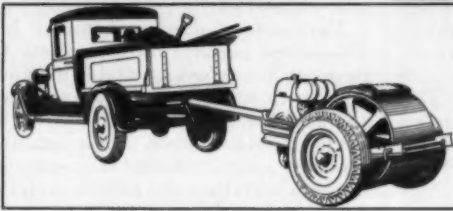
## Additional Appropriation For Highway Construction

Companion bills, HR-5028 in the House of Representatives and S. 1771 in the Senate, providing \$125,000,000 each

for the fiscal years ending June 30, 1938 and 1939, for emergency construction of public highways, are now in the hands of the House Committee on Appropriations and the Senate Committee on Post Offices and Post Roads, respectively. The bill also provides for the appropriation

of an additional \$50,000,000 for the two-year period for the construction of secondary or feeder roads, including farm-to-market roads, rural free delivery roads, and public school bus routes. The amounts apportioned to any state need not be matched by the state.

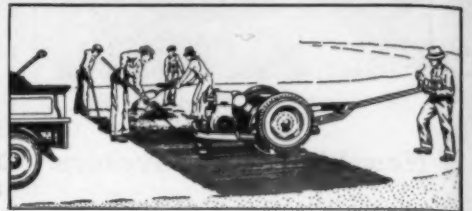
## ANNOUNCING A MOTORIZED WHEELED ROLLER



To and from the Job  
a High-speed Trailer

MODEL 135  
COMPRESSION 135 LBS. PER  
INCH OF CONTACT

The most economical  
and efficient Roller  
for all types of patch  
work and miscellaneous  
small jobs.



On the Job  
a Self Propelled Roller.

Write for DETAILS!

The WHEELED ROLLER Corp. ★ SAN ANTONIO, TEXAS

## CONSTRUCTION HAULERS

NO LONGER SAY:

*"Some day I Hope  
to own a White"*



THEY'RE BUYING THEM AT A RECORD RATE!

● When you can buy a White—quality built as a truck to do a truck's work—for only slightly more than "passenger car" types—it is no wonder that orders for the new White Model 700 have given the factory a 35% increase in deliveries for January and February over the same period of last year—the greatest year in all White history!

Modern performance, unequalled economy and White stamina make the new White quickly

eliminate any initial price differential. Exclusive safety features, streamlined beauty of unusual advertising value and White dependability are *plus* features you get only in the new White.

Check the money-earning features of the new Model 700 at the White Branch or Dealer in your city—or telephone for a demonstration. Terms as easy as any in the industry.

THE WHITE MOTOR COMPANY • Cleveland

NEW MODEL 700

BASE PRICE **\$985**

and up—  
at Cleveland Plant  
for Standard Chassis

THE LOWEST PRICE FOR WHICH A *White* TRUCK HAS EVER SOLD!

**SIMPLE  
RUGGED  
DEPENDABLE**

SELF  
PRIMING  
PUMPS

**STERLING  
QUALITY**

**Heavy Duty Shafts  
Double Bearing Supports**

Sterling's heavy duty shafts are supported on deep groove double ball bearings or Timken roller bearings—a radical improvement over the construction employing a single ball bearing support.

Sterling's improved flexible coupling eliminates the trouble-some splined shaft used on some makes of pumps.

Ask for New Contractors' Catalog No. 37 which tells about the many advantages of Sterling Pumps.

**Sterling**  
MACHINERY CORPORATION

## Picks and Shovels

(Continued from page 1)

Just before departing for Trinidad, I read somewhere that the asphalt lake is one of the four hottest places on earth. So I looked forward eagerly to an experience of sweltering under a tropic sun with the additional heat of the asphalt offering a preview of what the next world may be like. Imagine my surprise when I found a delightful cool breeze sweeping across the lake, strong enough to make hanging on to one's hat considerable of a chore, and was told that the temperature there is no worse than any hot summer day in New York, and can not be compared with the record heat of our own Midwest. It is true that a thermometer laid on the asphalt in the mid-day sun will register 140 or 150 degrees, but so I think would a thermometer laid on the asphalt on Fifth Avenue any good summer day!

### Asphalt Digging

To be a "pitch digger" in Trinidad is the kind of thing ambitious little native boys (if any) dream about. There's considerable prestige attached to the position, which is often passed on from father to son. It's a small exclusive little group, and each one works with his own gang of five helpers. The asphalt is broken up by the digger with a mattock and then the helpers or "headers" carry the pieces of asphalt (on their heads as their designation infers) to their assigned dump car of the narrow-gauge railway close by.

The manager of the operating company told me of a friendly competition among the "headers" to see who could carry the largest and heaviest piece of asphalt to the car. There were a number who boasted of their superiority but were forced to admit defeat after a struggle with the enormous piece of asphalt selected for the trial. The winner carried a piece of asphalt which required four men to lift it to his head and which, when placed on the scales afterward, weighed about 400 pounds. That, of course, was merely a demonstration of prowess and in the ordinary day's work, the men do not burden themselves with such loads as that, although the average pieces run from 40 to 100 pounds. As can be seen in the photograph on page 1, they wear a special head gear on which the piece rests.

They seem a happy lot, childishly curious about visitors, at least when they are accompanied by the "Boss," and very eager to have their pictures taken. Although they seem to go about their work in a primitive and leisurely fashion, they accomplish what is required of them and the product of their labors finds its way to all parts of the world. Waiting in the refinery on the day I visited it were more drums than I'd ever seen at one time, ready for shipment to East Africa.

### Other Points of Interest

There are so many interesting things about the asphalt lake that one scarcely knows where to start or, what's worse, when to stop. I could tell you about the history of the lake, beginning with Sir Walter Raleigh's visit and discovery of asphalt, some geological facts, which are fascinating, the stories of discovering all kinds of fossils, the mystery tree which appeared in 1928, disappeared and hasn't been seen since, how the asphalt is taken from the lake to the refinery by railway, the tracks of which follow a serpentine path in spite of regular re-laying, due to the constant but imperceptible shifting of the asphalt, how the asphalt is prepared for shipment and dozens of stories told while I was there.

But most of this has all been told before. Perhaps the nicest and briefest thing I can say about my visit to Trinidad's Asphalt Lake is "Go and do thou likewise."

## Road Maintenance Costs Are Cut in Minnesota

While the payroll of the Minnesota Highway Department has jumped from 2,200 persons in 1931 to 4,471 persons in 1936 in an effort to stagger or rotate employment wherever possible, in compliance with Federal Government efforts to spread employment, the actual cost of maintaining the state trunk highway system in figures of man-hours of labor per month per mile dropped from 41.7 in 1932 to 34.9 man-hours per month per mile in 1936.

In 1935 the record shows 34.3 man-hours per month per mile of maintenance. While the 1936 figure was slightly higher, this was because of extreme snow conditions encountered, the Department spending approximately \$1,500,000 on snow removal, or more than half a million dollars more than in 1935. In February, 1936, snow removal cost approximately \$800,000 for a new high monthly record.

Maintenance costs in 1936 approximated \$8,000,000, or slightly more than \$400,000 more than in 1935 but the record of time spent on roads, as shown in the man-hours per month per mile record, shows a lower figure per mile, as compared with 1932. After the trunk highway mileage was increased on January 1, 1934, it was necessary to add a large number of maintenance employees

but these were so spread out over the enlarged system that the cost per mile was materially reduced, according to State Highway Commissioner N. W. Elsborg. The peak load of maintenance men carried by the Department was in February, 1936, when 4,392 men appeared on the Department's payrolls, although some of them were on a temporary, or part-time, basis.

### "SPEED EQUALS PROFITS"

Contractors use "FLEX-PLANE" equipment for installing dummy joints and surfacing concrete. "Dummy joints are the vertebrae of concrete roads."

"FLEX-PLANE" wide screed finishing machines screed while traveling backward. One machine builds roads 10 to 22 feet wide.

Secure this good equipment, speed up your work, then devote your time to other details.

Flexible Road Joint Machine Company  
WARREN, OHIO



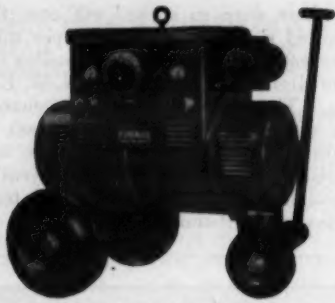
# KOEHRING Autocycle Paver

Koehring Paver stability permits safe, "non-tip" pouring from shoulder to slab at approximately right angle — long, full usable boom assures maximum reach for concrete spreading — free, oscillating boom maintains vertical bucket suspension regardless of paver position — Heavy Duty construction guarantees necessary rigidity for shoulder to slab pouring.



## KOEHRING COMPANY

Pavers • Mixers • Shovels • Cranes • Draglines • Dumpsters • Mud Jacks  
3026 WEST CONCORDIA AVENUE, MILWAUKEE, WISCONSIN



The New 1937 Hobart Welder

### Current-Saving Control Feature of 1937 Welders

A feature of the new 1937 simplified electric arc welders, announced by Hobart Bros. Co., Troy, Ohio, at the National Metal Show in Cleveland, is the selective motor horsepower control. It is claimed that with the new Serial MN current-saving models only one-third the usual starting current is required, the power factor of the machine and its efficiency having been improved, and that it is possible to use the equivalent of a motor of one-half the horsepower rating for welding in ranges up to one-half to two-thirds the rated capacity of the generator.

The operation of the selective motor horsepower control is accomplished as easily as the starting of an ordinary welding machine. A convenient latch locks the handle in the "low" position, where only half the rated motor horsepower is used for starting and for welding up to one-half the rated generator capacity in continuous manual arc welding, and up to two-thirds the rated capacity for intermittent welding. When it is desired to operate at higher rates, a convenient lever releases the handle for turning to "high" position where the full rated horsepower of the motor is available for full load and overload welding. At the same time it is possible, when so desired, to start and weld in the "high" position without turning the handle to "low" at any time.

The new Series MN models are available in 75, 100, 150, 200, 300, 400 and 600 amperes. All Hobart machines in this and the MK series are also built in standard horizontal position and operate at 1,750 rpm, embodying the same principles and equipment features, regardless of size.

Complete details on this new MN series and also on other Hobart electric arc welding machines may be secured direct from the manufacturer by mentioning this magazine.

### Finishing Machine Spreads Crushed Stone

An interesting 2.6-mile, two-course, stone-base road with a black-top mixed-in-place surface was recently completed in the vicinity of Youngstown, Ohio, by the Mahoning County Highway Department. The two-course stone base had a total thickness of 10 inches after rolling and the mixed-in-place top was 2 inches thick.

Standard Heltzel steel road forms were set up and stone was hauled in by trucks and dumped in front of a Flex-Plane finishing machine spanning the



A Flex-Plane Machine Striking Off Stone Base Course

full 30-foot width of the roadway. The finishing machine first struck off the stone base which was then sprayed with tar, bladed and again sprayed with tar. The finishing machine was again used to strike off the course. After the base course had been completed and rolled, the top course was struck off by the finishing machine, sprayed with the bituminous material, mixed by a blade and then finally struck off with the same finishing machine used for the previous operations.

After the black-top road was completed, a 2-foot concrete gutter was built on both sides of the road. The work was in charge of George Montgomery, Mahoning County Engineer; Charles Gilmour, Supervising Engineer, and Louis Arn, Superintendent.

### A New Organic Road Binder

Raylig Binder, a by-product of the manufacture of rayon pulp which contains lignin, a glue-like natural cement that binds the fibres of wood together,

has been used economically for dust prevention and road stabilization both on the Pacific and Atlantic coasts. Details regarding its use and costs may be

secured from the Raylig Division, Rainier Pulp & Paper Co., White Bldg., Seattle, Wash., by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

*Mall*  
TRADE MARK

## CONCRETE VIBRATORS

A TYPE AND SIZE FOR EVERY JOB!



**THE UNIVERSAL!** Operates at high speed—9000 r.p.m. from either A.C. or D.C. current. A very efficient unit for compacting dry mixes of concrete in all types of structures—walls, bridges, footings, and abutments. A well designed unit at an unusually low price! Write for descriptive literature and prices on this vibrator; also, MALL gas engine, air, and other electric sets.

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# "SHOCK" ABSORBERS



## FOR MODERN ROADS & STREETS

The destructive forces of road expansion and contraction can be resisted effectively by the correct installation of Truscon Expansion and Contraction Joints.

Truscon Expansion Joints provide:

Adequate space for expansion of the concrete. . . Assurance of parallel faces for concrete slabs. . . Perfect seal to prevent infiltration of inert material. . . Efficient transfer of load from slab to slab. . . Simplicity and economy of installation. . . Utmost durability throughout the entire life of pavement.

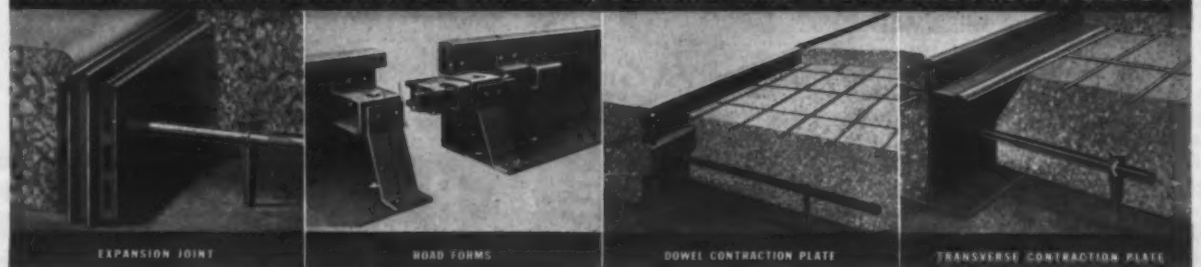
Truscon Contraction Joints are engineered to provide:

Complete and uniform separation between slabs. . . Water-tight seal at the surface . . . Efficient transfer of load from slab to slab . . . Simplicity and economy of installation . . . Utmost durability under severe conditions.

Complete details of construction and installation of Truscon Steel Reinforcing Products for modern roads and streets are quickly available. Write for a copy of the NEW Truscon Catalog of Highway Products.

**TRUSCON STEEL COMPANY • YOUNGSTOWN, OHIO**

### TRUSCON AIR CUSHION EXPANSION JOINTS AND CONTRACTION PLATES



## Underground Reservoir Protects Underpass

### At Famoso, Calif., State Provides Storage to Save Overloading of Pumps and Flooding from Cloudbursts

IN a country where the streams are all dry beds of gravel, and irrigation is the order of the day, one is naturally surprised to find a rather large underground storage reservoir being constructed as a part of a railroad underpass. If a hasty visit in the summer is prolonged, the surprise changes to praise for the engineers who design the long trestle bridges, huge culverts and retaining walls to care for the rushing water that sometimes tears down a dry stream bed with a wall of water 5 feet high, bringing the first dampness to the dry stones of the arroyo. It is then also that the need of a storage reservoir in a depressed area where an underpass is constructed is understood and congratulations extended. The use of the underground storage structure is not common but it was used at the Famoso underpass 20 miles north of Bakersfield, California, on U.S. 99.

#### The Problem

The Southern Pacific main line up the San Joaquin Valley had been crossed by the highway several times and gradually grade crossings have been eliminated, thus greatly increasing the safety of this very heavily-traveled route. The fact that the heat is intense during the day in summer makes the night travel very heavy and it is during those dark hours that traffic accidents are the most frequent.

A wide sweeping curve, devoid of the deadly sharp turn that causes so many speedy drivers to crush their machines and skulls on the wing walls of the structures, gives an easy approach to the underpass from either side. The approaches are about four times as long

as others in this area. As this section is famous for its cloudbursts, it was considered a good investment by the Bridge Department to install a large underground storage basin rather than increase the initial cost by installing larger pumps that might not be used more than five times a year. The prompt removal of water from such depressed roadways is most important because the traffic on this main highway consists of a constant flow of heavy trucks with trailers hauling long distances, local trucks hauling to distant markets, through buses, and the continuous flow of tourist automobiles. This traffic amounts to 5,000 vehicles a day divided quite evenly through the 24 hours. To stop it for several hours because of the installation of pumps too small to handle the water delivered by the larger drainage area of the longer approaches would defeat the purpose of the larger approaches. On the other hand, the larger investment for the bigger pumps would be too great a drain on the finances of a Division already called upon for more structures than it can build with the funds available.

#### The Solution

The solution of the problem was the construction of a large reservoir capable of storing temporarily about 110,000 gallons of the water that falls so precipitously. The reservoir is roughly 60 x 40 feet in plan and 6 feet deep. It is beneath the entire roadway and sidewalk areas of the underpass. Two pumps are installed with a combined capacity of 800 gallons per minute against a 35-foot head and 600 gallons against a 40-foot head. These are controlled automatically by a float, alternate on small flows and work together on large flows.

F. W. Panhorst is Acting Bridge Engineer under C. H. Purcell, State Highway Engineer, California Division of Highways.

### Portable Crushing Plants

Telsmith portable crushing units, made by the Smith Engineering Works, 4014 No. Holton St., Milwaukee, Wis., are made both for coarse crushing and for fine reduction. Where specifications permit the use of coarse rock, 1½ to 2½-inch sizes, the Telsmith portable unit may be equipped with a Telsmith primary breaker, sizes 6-B or 8-B. Such an outfit will deliver 1½ to 2-inch rock in large tonnages.

Where finer sizing is required, the same outfit may be equipped with the No. 32-B Telsmith reduction crusher for the production of ¾ or 1-inch aggregate in large capacity. Where ¼ to ⅝-inch aggregate is specified, Telsmith recom-

mends the No. 240 equipped with the No. 24 Gyrasphere. Between these two extremes, there is the range of service offered by the Telsmith Wheeling jaw crusher.

In the Telsmith portable unit, the crusher is in a closed circuit with a bucket elevator and vibrating screen. No product can escape from the circuit to the finished product conveyor until it passes the screen. The standard unit is designed to furnish only one finished size, but this product may be reclassified into several grades by the installation of a screen over the storage bin.

A detailed description of these portable plants is contained in the new Bulletin No. 265-B, copies of which may be secured free direct from the Smith Engineering Works.



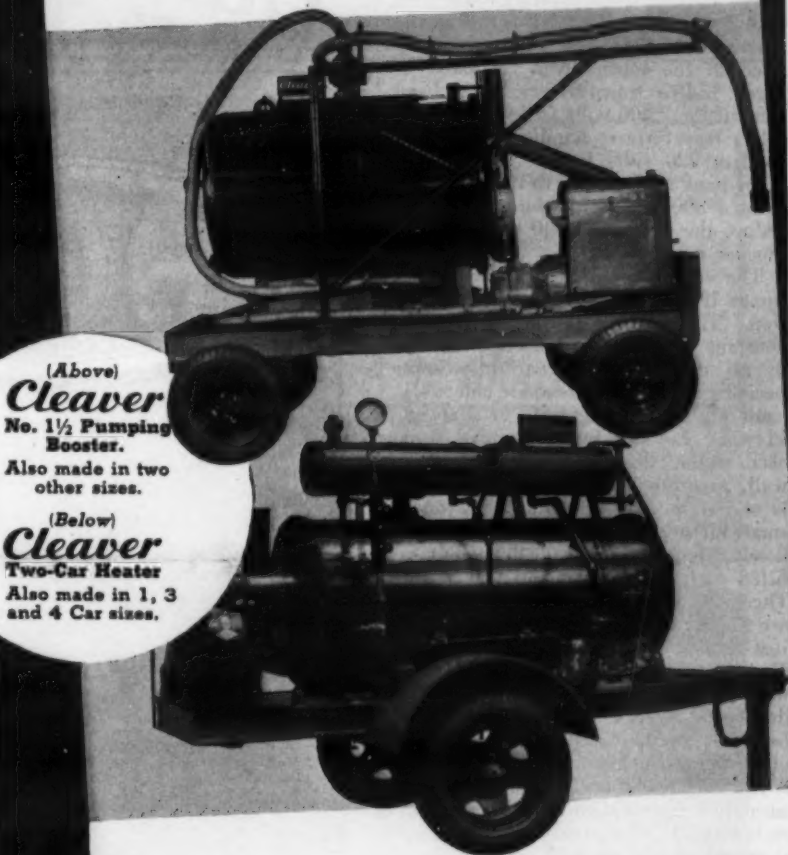
One of the New Telsmith Portable Crushing Plants in Operation in Old Mexico

## "CHEAPER-MORE SATISFACTORY"

*says well-known contractor\**

"We have found our No. 2 Cleaver Booster much cheaper and more satisfactory to operate than any type of heating equipment that we have used in our experience in the road business. We can heat 40,000 gallons in eight hours and have never had to hold up a job for want of hot oil."

\*(Name on request)



(Above)  
**Cleaver**  
No. 1½ Pumping  
Booster.

Also made in two  
other sizes.

(Below)  
**Cleaver**  
Two-Car Heater  
Also made in 1, 3  
and 4 Car sizes.

#### MONEY-SAVING FEATURES CONCEIVED AND OFFERED BY CLEAVER

- Quicker steaming—30 minutes from cold water start. Saves idle time.
- Low water consumption. Approximately one barrel of make-up water per car. Saves haulage.
- Light, compact, easy to transport. Permits location nearest work. Saves hauling costs.
- Over 80% efficiency, fuel to steam. Large saving.
- Use of return condensate prevents excessive liming. Increases efficiency. Saves fuel.

#### EXCLUSIVE ADVANTAGES OF CLEAVER BOOSTERS

Bituminous materials heated to application temperature, directly, without heating tank car. Any temperature desired. Big gallonage. No water required. Speediest in heating. Protects material from specification change. No coking.

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**Cleaver** TANK CAR HEATERS  
AND BOOSTERS

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386-2

## The Casper-Alcova Irrigation Project

(Continued from page 22)

by V-belt drive to two Gardner-Denver two-stage air compressors running at 870 rpm. The third 125-hp unit is direct-connected to a 60-kw G-E three-phase, 2,400-volt a-c generator and the smaller unit is direct-connected to a 40-kw G-E generator. Drills and jackhammers are driven by the air compressor and the generators furnish the power for a 60-hp motor on the mucker in the tunnel, operating about 3½ hours each 8-hour shift; a 15-hp motor on the ventilator fan in the tunnel; two ¾-hp motors on the water pumps in the tunnel; two 1-hp motors for miscellaneous work; a 5-hp motor in the carpenter shop; a 2-hp motor in the blacksmith shop and a 38-hp Westinghouse 440-volt motor generator set for charging the six banks of 1,500-ampere batteries used in the locomotives. A bank of three 15-kva transformers steps down part of the 2,400 volts to 440 volts, two 5-kva transformers handle the lighting load at 220 volts from 2,400 and another bank of three 25-kva transformers, located 800 feet inside the tunnel, also reduce the current to 440 volts for the mucker motor.

The engine room is as carefully set up as if it were a permanent installation. The mechanical line-up is under constant supervision, complete records of all equipment are carefully kept, periodic inspections are made and lubricants are applied regularly or changed. Plywood radiator tunnels extend from each engine through the engine room wall, assuring adequate cooling. Fuel is stored in a 6,400-gallon tank on a small hillside 100 yards from the plant, flowing by gravity to two standard tanks filled each shift from overhead pipes. The two diesels operating generators are fueled from small auxiliary tanks just outside the plant, at a 3-foot head. The main fuel line has two muslin-type filters for the whole supply. Inside of the engine room, each of the four engine lines has another of these filters ahead of a Niagara fuel meter, so that all fuel is filtered three times and measured accurately before reaching the main filters on the engine. Compressed air produced is stored at 100 pounds pressure in a large horizontal tank outside the building and piped to the tunnel take-offs.

### Personnel

The Casper-Alcova irrigation project is being constructed by the U. S. Bureau of Reclamation, with H. W. Bashore, Construction Engineer for the Bureau, as Resident Government Engineer on the project.

### Precision Methods Used In Tractor Manufacture

Much has been said about precision manufacture in the automobile industry, but, unlike the automobile engine, the tractor engine operates at or near its full capacity during most of its life and gets no 500 miles of easy driving when first put in use. Also, the crawler tractors put into service on construction

jobs are called upon to withstand a good deal of abuse.

By text and by unusual photographs a new booklet just issued by the International Harvester Co. describes the precision methods used in the manufacture of International TracTracTors. Precision manufacture, as defined in this

booklet, is building each part of a machine to exact specifications and has given to the world in the present generation the modern equipment which has made possible the kind of America in which we live today.

Copies of this interesting booklet may be secured direct from the International

Harvester Co., 606 So. Michigan Ave., Chicago, Ill., by mentioning this magazine.

The Mozambique Government has decided to spend \$480,750 on the repair and maintenance of roads in Portuguese East Africa during 1937.

Get this  
NEW  
CATALOG  
of Owen  
Buckets

Owen Buckets

for DIGGING •  
for RE-HANDLING •  
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THE OWEN BUCKET COMPANY  
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## HEAVY DUTY HAULING DEMANDS REAL HEAVY DUTY EQUIPMENT

Contractors, quarry operators, dirt movers, in fact the entire field of heavy dump truck movers, recognize the superior features of Hug transportation equipment, because Hug offers a real heavy duty transportation unit.

Hugs are built throughout with extra heavy duty truck units, including massive arc welded I-beam frames, powerful heavy duty truck engines, rugged axles, transmissions, and springs. All the way through, Hugs are completely designed to operate profitably on the toughest jobs.

Hug Roadbuilder chassis and dump bodies are engineered and built as a completely balanced, integral unit. This heavy duty construction, balanced load distribution, short wheel base and turning radius together with Hug special features of design puts Hug in a heavy duty hauling class by itself.

Bring your transportation problems to Hug, for whatever your requirements there is a Hug unit that will lick them profitably. Let Hug engineers show you why the superior transportation features of Hug Roadbuilders will greatly reduce your hauling costs.

### THE HUG COMPANY

514 Cypress Street

HIGHLAND, ILL.

BUILT TO MEET A CONDITION



VIBRATING SCREENS  
VIBRATING ROLLERS  
For Concrete Pavements

IMMERSION TYPE VIBRATORS  
Flexible Shaft Drives  
Gas and Electric—All Sizes

ONE-MAN PORTABLE VIBRATOR  
"THE WOLLOPER"  
Internal or Surface Type  
Weight 85 lbs., complete

GASOLINE OR ELECTRIC  
FLEXIBLE SHAFT VIBRATORS

The WOLLOPER  
ONE-MAN  
Jolt Vibrator  
BAILY  
VIBRATOR CO.  
1529 Wood St.  
PHILADELPHIA,  
PA.







A Bucyrus-Erie 10-B Shovel Powered with a Buda 4-D-186 Diesel

### Diesel Engines Power Many Small Shovels

In recent months there has been an unusual and increased interest in  $\frac{3}{8}$ ,  $\frac{1}{2}$  and  $\frac{5}{8}$ -yard shovels, cranes and draglines with more manufacturers developing these smaller sizes. To meet the demands of contractors for more economical power The Buda Company, Harvey, Ill., has developed two new diesel engines for small shovel and crane service. These are the 4-cylinder Model 4-LD-196 and the 6-cylinder Model 6-LD-275. The first has a displacement of 196 cubic inches and the second a displacement of 275 cubic inches, both are of the solid injection, full diesel type. For some time the Buda Model 4-D-186 has been used successfully on  $\frac{3}{8}$ -yard shovels.

The controlled-turbulence feature of these engines gives improved combustion, low maximum operating pressures, high workable mean effective pressures, better fuel economy, smoother running, reduced wear on reciprocating parts and bearings and a reduction of the compression ratio to a figure comparable with gasoline engine practice.

These new Buda diesel engines are particularly adapted to shovel, crane and dragline service, having torque characteristics that meet the heavy drag-down loads, and stand up under conditions of operation where loads may fluctuate from no load to peak load in a few seconds.

### New Quick-Shifting Single-Frame Graders

Two new graders designed particularly for combination work in which quick movement of the blade from ditching position to the high-bank cutting position is important have been announced by Caterpillar Tractor Co., Peoria, Ill. These new 12 and 10-foot graders have single member frames and will be known as No. 66 Single Frame and No. 44 Single Frame, since they are in the same weight classes as the No. 66 and No. 44 Double Frame models.

The single frame members are made of two ship channels, 9 inches on the No. 66 and 8 inches on the No. 44. These two channels are about 4 inches apart in the center, and a steel plate is welded over the top and bottom of both channels, forming a box-type frame member, about 11 inches wide. Immediately back of the blade-arm mounting, the frame channels separate and form two members, each a box section having plates welded between the channel flanges.



One of the New Caterpillar Power-Controlled Blade Graders, Designed for Quick Shifts from Ditching to High Cutting Position

Both blade-lift links are of the telescopic type and may be quickly extended for securing the most extreme blade positions for unusual jobs.

These models are offered in both power and hand control. With the power-controlled model, less than one minute is required to move the blade from ditching position to high cutting position, and with either of the models this may be done without offsetting the blade on the blade arms, or making any changes in the lifting or lateral shift links.

### New Wellman Works Mgr.

Announcement has been made of the appointment of J. Harry Warriner as Works Manager of the Wellman Engineering Co., Cleveland, Ohio. Mr. Warriner, who started working for this company in 1905 as tool-room boy, and has since served in a variety of capacities, the latest having been special sales work, has a record of 32 years of continuous service with this company.

## South Bend

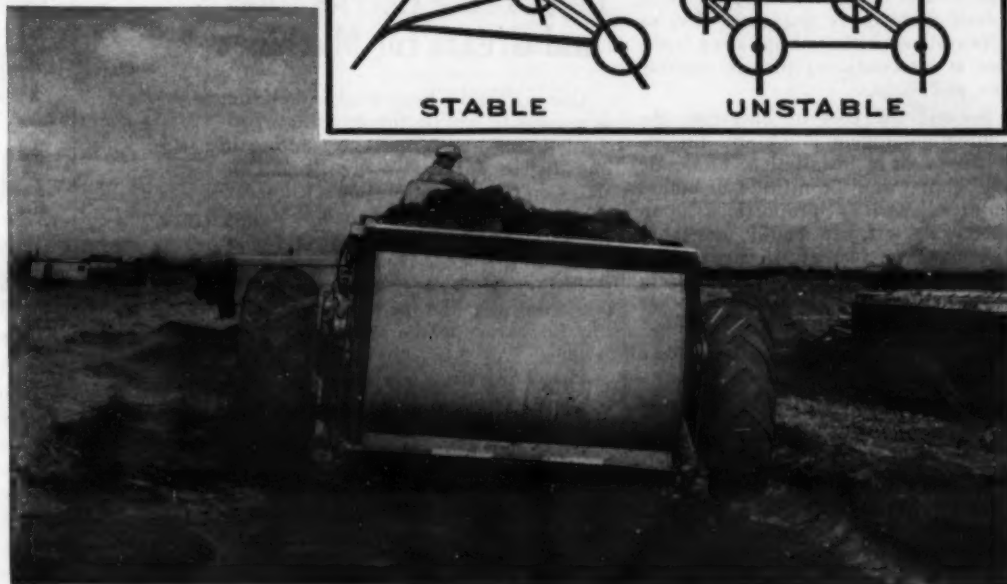
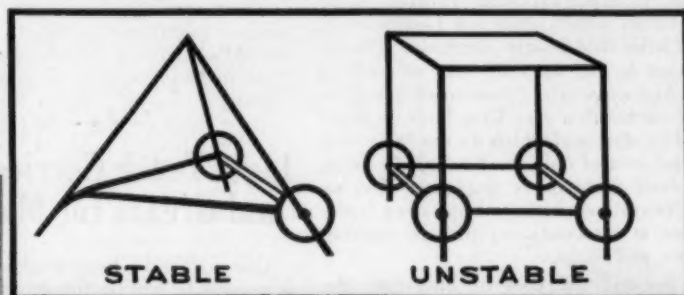
### Bituminous Material Distributor

EMBODYING 29 YEARS' EXPERIENCE

ECONOMICAL • EFFICIENT • STURDY  
NON-DRIP SPRAY BARS • QUICK SHUT-OFF  
ACCURATE APPLICATION • IMPROVED HEATING

MUNICIPAL SUPPLY COMPANY  
SOUTH BEND • INDIANA

Continental Wagon Scrapers are made in 5, 7 and 10 yard sizes for use with all sizes of crawler tractors. There's a Continental unit for every dirt moving job.



## The stability of two-wheeled design!

### 8 other Continental features:

1. Lightest in weight, yet strongest!
2. Simplest in design and all working actions!
3. Require less tractor power!
4. Backfill entirely over a bank!
5. Dump in close quarters!
6. Turn short and back easily!
7. Load, dump and haul faster!
8. Used for spreading and grading, too!



Continental Wagon Scrapers are of the two-wheeled type because this design provides greatest stability. Digging efficiency is unaffected in rough going — shorter turning is readily accomplished — the danger of upsetting is completely avoided — and less power is required for operation!

And stability is just one of the unique features of Continental Wagon Scrapers — they dig faster — they haul faster — and they dump faster!

Continental are the only Wagon Scrapers that will backfill entirely over the edge of a bank — over culverts — against walls. They will load anything that the tractor will pull through — rocks, tree roots, or other imbedded obstructions.

The Patented Front Apron forms part of the carrying bucket, and provides largest load carrying capacity. This feature, too, is a part of their greater ruggedness, yet lightness of weight.

Continental Wagon Scrapers are made in 5, 7, and 10 yard sizes for use with all sizes of crawler tractors. Mounted on rubber tired wheels or crawlers.

Cut your digging costs to the bone — speed up your operations — avoid breakdowns and delays — use Continental Wagon Scrapers! Over five hundred in use today on every kind of soil — short hauls and long — and every job a profitable job!

Send for detailed operating reports!

Sold and serviced by Allis-Chalmers dealers everywhere.

CONTINENTAL ROLL & STEEL FOUNDRY COMPANY  
Tractor Equipment Division

Railroad Ave.

East Chicago, Indiana

# CONTINENTAL WAGON SCRAPERS

## More Than a Billion For Highway Lighting

The wholesale illumination of 100,000 miles of highway in the United States for safe driving would cost \$1,300,000,000 in a ten-year period, according to the American Automobile Association, which asks that road lighting projects be individually determined on the basis of study and experimentation rather than on the basis of pressure and propaganda. "This is not a struggle between the forces of light and the forces of darkness," declared Thos. P. Henry of Detroit, Mich., President of the AAA; "it is a matter of proceeding with care, caution and due regard for all the factors involved. Lighting certain stretches of road where the need has been proved is one thing; spending a billion or more dollars on the basis of inadequate knowledge and hysteria-producing propaganda is an entirely different matter."

"A given stretch of road should be lighted only when it is definitely proved that illumination will prevent night accidents which could not be prevented by other less costly methods. Illumination is not the only way of making the highways safer; there are other effective means that save lives both by night and by day, and which do not have such a high cost of upkeep. I refer, of course, to such features as dual-lane, divided highways; separation of opposing traffic lanes at intersections; proper warning signs, and so on."

"Because the cost of operating the illumination system eventually far exceeds the cost of installation, wholesale road lighting would constitute an annual charge of serious proportions upon motor transport. It would inevitably mean either an increase in already exorbitant motor taxes or a reduction in the amount of money available for other greatly-needed highway improvements."

Mr. Henry points out that further experiments with non-glare headlights is warranted and would be effective on all highways and not merely on the small percentage which could be provided with highway lighting in the years just ahead. As in all new programs, initial cost, maintenance cost and the relative values of the new method and other possible developments must be considered in making all installations. In the all-important field of highway safety, the greatest care and study must be given to

selecting the means which will produce the safest highway most economically and protect the lives of its users.

## Heavy-Duty Truck Tires For Construction Jobs

Truck tires designed for heavy-duty service in the construction field where motorized equipment is used to move large quantities of soil and rock have been announced by the B. F. Goodrich Co., Akron, Ohio.

These large tires, known as Earth Movers, will carry a maximum of 15,740 pounds a casing, or nearly 8 tons; are mounted on 13-inch rims; weigh 449 pounds, and are available in 12, 16 and 20 plies. The tubes weigh more than 53 pounds and the flaps 12 pounds, according to the manufacturer. Four of these tires mounted on one axle will carry 60,000 pounds. The tires may be purchased with two types of tread, one for trailer use on free moving wheels, and the other incorporating a super-traction tread for use in mud and on soft ground.

These new tires are now in use on various government projects, including the All-American Canal, the Mohawk Dam in Ohio, and in Mississippi flood control work.

## Light Truck Carries Guns and Grease for Machines

One man and a Ford truck are all that is needed to handle the greasing of all the equipment that may be working in one district for the Moore Bros. Construction Co. of East St. Louis, Ill. How that comes to pass is the story of Roy Blackwell, a mechanical genius associated with this contractor, who has developed not only this greasing truck, but other useful and time-saving machines for this and other construction organizations.

This Ford truck carries a LeRoi 2-cylinder gasoline engine with a self starter taken from an old Dodge truck. The engine runs a small Curtis air compressor delivering the air to two air containers, one of which is used at high pressure for the grease guns and the other for inflating tires at a lower pressure. The grease guns deliver their shots of lubricant at 4,000 pounds per square inch pressure, insuring that every tight nipple gets what is coming to it.



C. & E. M. Photo

Although Odds and Ends Were Used to Equip this Utility Truck, It Performs Like a Thoroughbred in Servicing and Lubricating Equipment on Moore Bros. Job.

The starting motor is also a generator and is used to charge the storage battery for starting the engine and also for supplying current for the jointed spotlight that lights up the equipment that is being greased. In addition to the guns and lights the truck carries three drums of lubricant; chassis lubricant, cylinder

oil, and transmission lubricant.

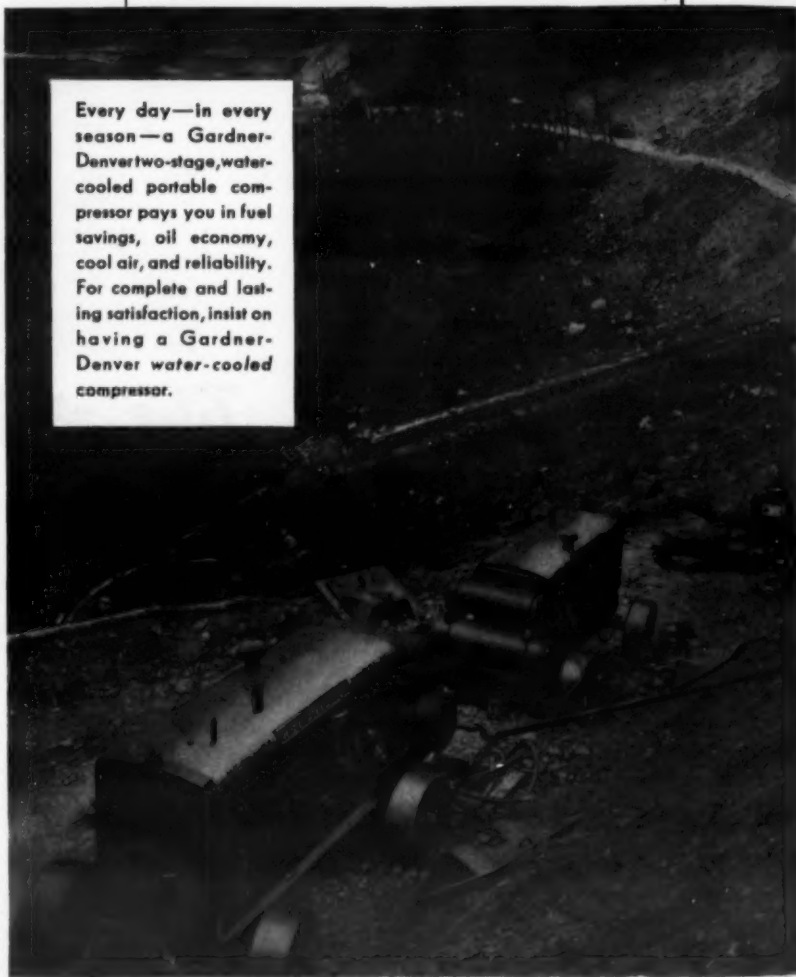
A trip to the yard where this truck was standing awaiting its nightly trip is a source of wonder and amazement for there were more devices which had been built to solve momentary problems and then were left to be dismantled when the parts were needed for other work.

WATER-COOLED

TWO-STAGE

THE COMBINATION THAT  
PAYS YOU EVERY DAY

Every day—in every season—a Gardner-Denver two-stage, water-cooled portable compressor pays you in fuel savings, oil economy, cool air, and reliability. For complete and lasting satisfaction, insist on having a Gardner-Denver water-cooled compressor.



★ Gardner-Denver 315 foot Diesel engine driven portable compressors on Skyline Drive, Shenandoah National Park, Virginia. M. E. Gillies, Monett, Mo., Contractor.

GARDNER-DENVER COMPANY, Quincy, Illinois  
SINCE 1859

**GARDNER-DENVER**

Water Cooled for Continuous Service



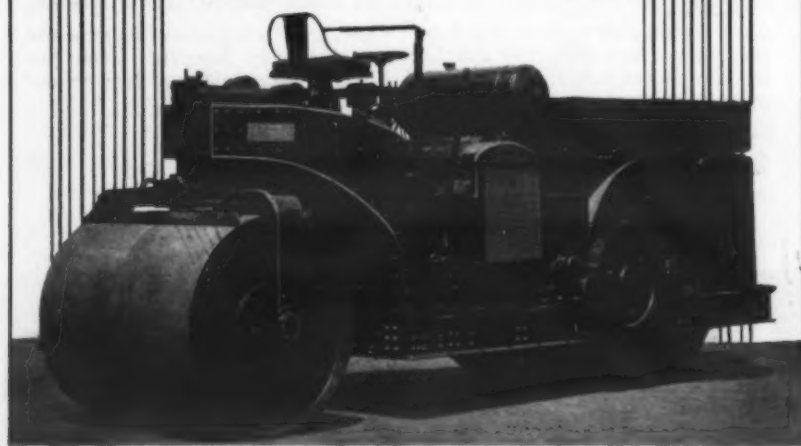
FAITHFUL  
PERFORMANCE

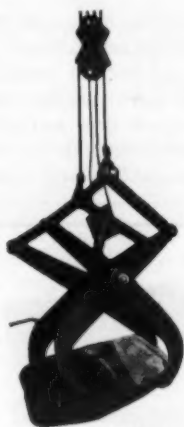
ECONOMICAL  
MAINTENANCE

—On these pillars—

**BUFFALO - SPRINGFIELD'S**  
reputation can safely rest  
for another 46 years!

**BUFFALO-SPRINGFIELD ROLLER CO.**  
Springfield Ohio





The New Owen Rock Grapple

### A New Rock Grapple

A new four-tine Type H rock grapple, utilizing two parallel pairs of tines which function independently, gripping the object firmly on two of its sides, regardless of irregularities in shape or variations in width, has been announced by the Owen Bucket Co., 6030 Breakwater Ave., Cleveland, Ohio.

The unusual action of this Owen grapple is accomplished by incorporating a patented sheave block which equalizes the gripping power and eliminates the possibility of the stone rolling between the tines and dropping out.

Recommended for all classes of rock work, the Type H grapple is available in three standard sizes but can be furnished in any intermediate capacity.

A new Owen catalog, just off the press, contains complete information on this new grapple as well as on the Type RA grapple with its independently operating tines.

### Euclid President Dies

A. P. Armington, President of Euclid Road Machinery Co., of Cleveland, Ohio, died suddenly March 18 aboard the S. S. President Adams while on a world cruise. Mr. Armington had been suffering from heart disease for some time.

### California City Lights New Through-Highway

Does it pay to light highways? The City of Santa Barbara, Calif., has found that it does. A story of how a recent installation of highway units reduced night accidents on the heavily-traveled 101 highway is told by Harry V. Dobson, Lighting Superintendent for Santa Barbara.

"The new 101 highway through Santa Barbara was built by California to relieve traffic congestion through the city. For 1.6 miles it parallels the railroad. As soon as the road was opened to traffic, this section became a speedway. The highway was first lighted with 400-cp units, placed at street intersections about 512 feet apart.

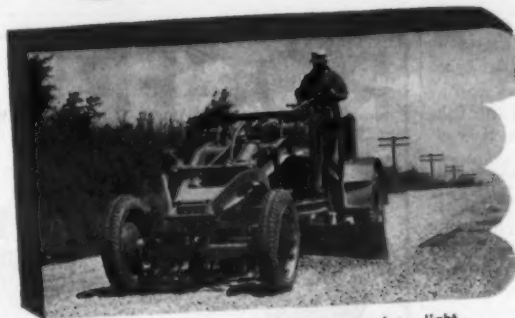
"During the first 17 months that the road was opened to traffic, and checking for only the 1.6-mile straight-away, there were 32 accidents in which seventeen people were injured and five were killed outright or died from the injuries sustained. A study of the accidents showed that 73 per cent happened between sunset and sunrise, and that 43 per cent of the total happened between sunset and 8 p.m.

"Six sodium lights, designed by G-E engineers, were installed on trial along the 1.6-mile stretch and these were compared with other types of lighting, both by visual inspection and foot-candle tests. Motorists were interviewed to get their reactions, and with few exceptions stated that visibility was better.

"After testing for several weeks, it was decided to light the balance of the straight high-speed portion of the road, and to light the corners and dangerous intersections through the city with sodium lamps. The 1,000-cp units used were spaced about 512 feet apart and 23 feet above the surface of the road.

"During the five and a half months that the lights have been in operation, there have been only five accidents, three injuries and no deaths on the same portion of the road for which the accidents were previously checked. Only one of the injuries occurred in a night accident."

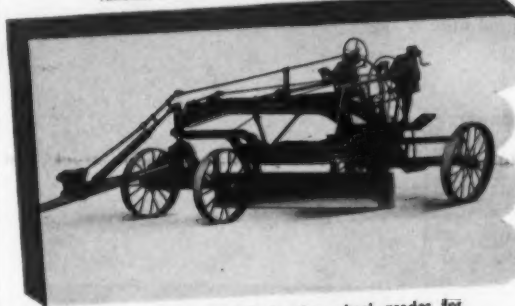
## 5 points in favor of... GALION ROAD MACHINERY



JUNIOR PATROL GRADER—Inexpensive, light weight, full hydraulic control. Gas or kerosene 21 h.p. motor. Speed range, 2 to 10 miles per hour.



HEAVY DUTY MOTOR GRADER—Latest design for difficult work with 50 h.p. Diesel engine or Case LI Industrial tractor. Hydraulic control, dual tires, or tandem drive with four or eight tires.



NO. 108—A new 8-ft. leaning wheel grader for moderate work. Exceptionally rigid and rugged for its weight. Easier manual control and wider range of adjustments.



NO. 10—Leaning wheel grader with hydraulic control. An efficient and inexpensive unit for general maintenance work. Also graders with manual control.



CHIEF ROAD ROLLER—Powered by dependable six cylinder engine. Hydraulic steering and scarifier-roll-a-plane attachment if desired. Also Warrior, Tandem and portable rollers.

GALION BUILDS THE RIGHT UNITS FOR ROAD BUILDING AND MAINTENANCE

GALION DESIGN IS BACKED BY 30 YEARS OF ENGINEERING EXPERIENCE

GALION UNITS ARE BUILT FOR YEARS OF SERVICE

GALION BUILDS EVERY UNIT FOOL-PROOF AND TROUBLE-FREE

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## ALL EYES ARE ON THIS LINE

CMC equipment leads the field in improvements—features—new items—new money-making ideas for the contractor.

Get information on CMC Mixers all sizes—"Dumpover" Pneumatic Tired Concrete Carts, Hoists, Pumps, Saw Rigs, Wheelbarrows.



The most talked of catalog in the industry. Write for your copy.



New streamlined Wonder Standard 3 1/2. Radically improved. The best small Mixer buy in the field.



2 Wheel End Discharge, fast mixing, fast moving Trailers. 5s—7s—10s.

WATERLOO, IOWA

CONSTRUCTION MACHINERY CO.,



THE GALION IRON WORKS AND MANUFACTURING CO.

Galion, Ohio  
National Distribution

## Work on Cape Cod Canal Highway

(Continued from page 2)

Paving was started at the east end and 5,800 feet completed at the request of the U. S. Engineer Department because one of the canal contractors was going to rip up the old road before June 29. The roadway was completed but it was well into October before the canal contract actually got under way. The second paving operation, about 7,500 feet long, was at the west end of the contract and then the gap in the center where the 144,200-cubic yard cut was located was paved.

The bottom stone in the section at the east end was put in with a bulldozer because the foundation gravel was sandy and would not hold the spreader. A short stretch at the west end was also put in in the same manner. Then a Handy Sandy spreader was used for both the bottom and top stone and this was also used to spread all of the stone in the gap where the last paving was done.

### Sidewalks and Curbing

A 7-foot sidewalk is provided the entire length of the paving contract on the canal side of the road. Granite edgestone or curbing measuring 5 inches thick and 16 inches deep and in lengths from 5 to 12 feet long, but mostly 5 to 7 feet in length, was laid with a 6-inch face exposed. This type B edgestone has a split face which is not finished but the top is dressed smooth.

### Guard Rail

All slopes and fills and other dangerous points are well protected with a 6-strand Multisafety cable guard rail of a new type furnished by the American Steel & Wire Co. The  $\frac{3}{8}$ -inch diameter bottom cables and one of  $\frac{3}{4}$ -inch at the top are held by spring clips to the oval steel shell posts. These posts are 8 inches on the long axis which is placed parallel to the road and 5 inches on the short axis. The steel posts are packed with a bituminous filler made up of 5 per cent by weight of a 30 per cent asphaltic oil premixed and tamped. The posts are  $6\frac{1}{2}$  feet long set  $3\frac{1}{2}$  feet in the ground. All cable fittings and anchors are of malleable iron.

The two end posts which are circular, 8 inches in diameter, are filled with 1:1 $\frac{1}{2}$ :3 concrete. All posts are painted with a gray zinc primer for the full length before installation. Then, from the bottom end of the post to the cable fittings, an asphaltic varnish was applied and above this the post painted a standard traffic white. The shells of the post both oval and circular are made of 3/16-inch sheet metal.

### Finishing Slopes and Seeding

All cut slopes on the job, of which there is a very large area amounting to over 60,000 square yards, were hand trimmed on a 2:1 slope and surfaced with 6 inches of loam secured mostly from stripping on the right-of-way, although there was some loam borrow.

The handling of the loam on the slopes, some of which were 175 feet high measured along the slopes, presented quite a problem. One of the Bucyrus-Erie shovels was re-rigged as a crane and, equipped with a clamshell, was used to rehandle loam, which was dumped at the bottom of the slope by the trucks, and swung as far up the slope as possible. The contractor built a construction road along the top of most of the slopes and dumped loam there and then bulldozed it over the edge. Then a crane was used to cast it down the slope. In the "no man's land" between the slopes the loam was spread entirely by hand.

After the 6 inches of loam had been

spread on the slopes, they were seeded and rolled. The use of the water roller on the long slopes at times furnished not a little sport for the men handling the rollers. The rollers, filled with water to increase their weight, were handled by three men from the top of the slope who

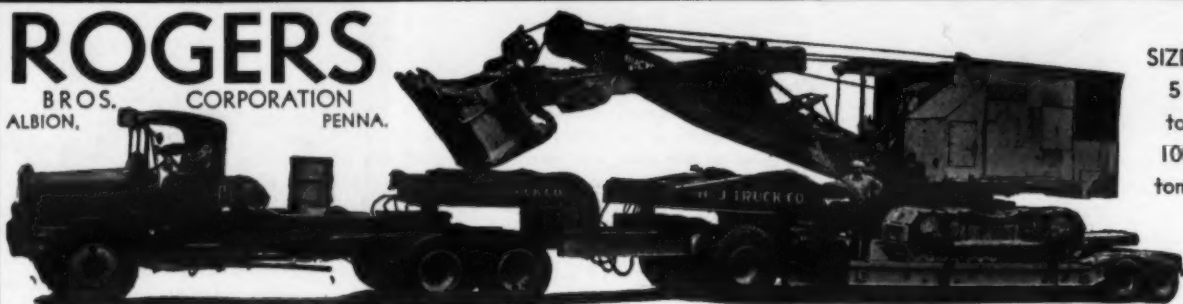
pulled on the long ropes to haul them to the top. Then they were allowed to roll down at varying speeds, depending upon the audience. If a greenhorn was at the bottom of the slope the men were apt to let the roll come down exceedingly fast until it was within 5 or 10

feet of the bottom. Then the brake they devised was put into action. The men used gloves at first but found that they wore out too quickly so they cut sections from old bicycle tires and allowed the ropes to slide through these. Squeezing

(Continued on next page)

# ROGERS

BROS. CORPORATION  
ALBION, PENNA.



No hauling job is too difficult for a ROGERS TRAILER—and there's a ROGERS suited to every job—large or small—write for catalog

# TRAILERS

SIZES  
5  
to  
100  
tons.

## BUILD A BRIDGE OVER "MUD MONTH"



"Mud month" . . . the long weeks of break-up weather, when roads lose their bottoms and highway officials lose their patience! "Mud month" . . . when mired farmers meet in fervent condemnation of highway workers and all their friends! "Mud month" . . . when officials sadly survey the swales which once were roads! "Mud month" is on the way out.

More and more highway officials are building a bridge over mud month with the new low-cost calcium chloride-stabilized surfaces. They stand up through "mud month"—they are dustless in summer.

Stabilized roads and streets are built of local soil materials by local labor, so the costs are low—little more than the cost of an ordinary graveled road. You get more miles of better road at a price you can afford to pay.

Calcium chloride-stabilized roads carry the farmer to market when he wants to go, and make him the road man's best friend. Thousands of miles of stabilized roads are showing an amazing record of ruggedness under "mud month" conditions. Builders and users alike pronounce them the greatest development in road construction in years.

End "mud month" in your section with stabilized soil roads. They meet the requirements of WPA and many other federal aid projects. Write for your copy of "Low Cost Roads." This booklet tells how it is done.

### CALCIUM CHLORIDE ASSOCIATION

The Columbia Alkali Corporation . . . Barberton, Ohio  
The Dow Chemical Company . . . Midland, Michigan  
Michigan Alkali Company . . . 60 E. 42nd St., New York City  
Solvay Sales Corporation . . . 40 Rector St., New York City

# CALCIUM CHLORIDE

FOR STABILIZING ROAD SURFACES

## Work on Cape Cod Canal Highway

(Continued from preceding page)

on the tire slowed up, and thus braked, the speed of the rope. One man at the bottom of the slope moved the roller to its next path lapping the one just rolled.

### The Herring Run

The fresh water ponds in the vicinity of Buzzards Bay and the Cape Cod Canal have been breeding places for salt water herring since the days of the Pilgrims. Each year the herring swim up the small streams to the ponds, lay their eggs, hatch the young and then swim out to sea. It is reported that the female young always return to the same pond to breed but only after three years. Herring Brook, from one of the large ponds just north of the canal, flowed generally along the line which was chosen for the original Cape Cod Canal. This made necessary the construction of a somewhat crude wooden run to permit the herring to get from the canal up into the brook.

The present projects of widening the Cape Cod Canal and the construction of the new highway made necessary the construction of a new herring run about 425 feet long paralleling the new road at Bourneville. This run leads from a box culvert crossing beneath the road to a stilling pool which is to be built by the Federal Government leading through another run to the canal. A total of 830 cubic yards of concrete was necessary for the construction of the portion of the herring run included in the state highway contract.

### Traffic Line Painting

The traffic line painting was not included in the paving contract but was done by the traffic men from the Middleboro District office of the Massachusetts Department of Public Works. The usual solid center stripes on curves and over the crests of hills and the broken lines between the traveled way and the parking strips were painted by machine. This machine is mounted on four rubber tires and carries a 5-gallon tank. The paint flows from the tank through short piping to a cross bar having ten 1/8-inch holes. The paint is thinned with gasoline when it is placed in the tank so that it will flow freely. A brush immediately behind the streams of paint spreads it in an even line. The drippings from

the holes and from the paint brush are taken care of in an ingenious manner. A drip pan which slides forward under the machine is quickly pulled forward just as the end of any section of a broken line is reached simply by pushing on a short lever attached to the handle bars. This makes clean broken lines possible without the stream of paint so frequently seen on roads marked with broken lines. The machine used for this work is an A.B.C. line marker remodeled by the Department of Public Works which installed the drip pan. This is now standard equipment on this line marker.

### Employment and Hours

All unskilled and intermediate labor for this job was secured through the local U. S. Employment Office while the skilled labor could be secured from any source within or outside the state.

The job was run with six 12-hour days a week, operating two 6-hour shifts a day. The double shift was operated from March through June 28 and then

was changed to one shift of 8 hours a day for five days a week, giving the maximum 40-hour week permitted.

The major quantities and unit prices in this contract were as follows:

### Major Quantities

ITEM	QUANTITY	UNIT PRICE
Roadway earth excavation.....	388,000 cubic yards	.20
Ordinary borrow.....	8,000 cubic yards	.20
Reinforced concrete ma-		
sonry, herring run.....	825 cubic yards	12.00
Broken stone, base course.....	8,300 cubic yards	4.15
12-inch cement concrete		
sewer pipe.....	1,340 linear feet	.50
15-inch cement concrete		
sewer pipe.....	1,106 linear feet	.75
12-inch reinforced concrete		
pipe.....	1,212 linear feet	1.00
15-inch reinforced concrete		
pipe.....	332 linear feet	1.25
18-inch reinforced concrete		
pipe.....	170 linear feet	1.75
12-inch heavy weight C.I.		
culvert pipe.....	210 linear feet	2.00
Gravel borrow.....	19,500 cubic yards	.20
Sand borrow.....	2,100 cubic yards	.80
Granite curb Type B.....	31,330 linear feet	1.10
Fine grading, roll and finish.....	242,500 square yards	.02
Reinforcing for structures.....	81,500 pounds	0.0325
6-strand multiple cable		
guard.....	19,550 linear feet	1.50
Trench excavation, drain		
age.....	3,600 cubic yards	.60
Loam borrow.....	12,200 cubic yards	.60
Loam and clay hardening.....	4,700 cubic yards	.50
Stone dust for sidewalks.....	350 tons	2.25
Seeding.....	61,000 square yards	.05
Oiled broken stone.....	7,120 cubic yards	6.69
Asphaltic cement.....	205,000 gallons	.115

### Personnel

This Federal Aid Project 258, Massachusetts Contract 2981, for the construction of 3.122 miles of 40-foot traveled way and additional parking areas was awarded to the Eastern Contracting Co., Quincy, Mass., at a cost of \$106,961.91 per mile. For the contractor John Pompeo was Superintendent and J. J. Mahoney was Resident Engineer for the Massachusetts Department of Public Works.

### New Littleford Dealers

Three new dealers have recently been appointed by Littleford Bros., of Cincinnati, Ohio. The Hall-Perry Machinery Co., Butte, Mont., will handle the Littleford account in Montana; the Jeff Hunt Road Machinery Co., of Columbia, S. C., will be the exclusive representative of Littleford in that state; and the Southern Iron & Equipment Co., of Atlanta, Ga., has been appointed Littleford dealer for the State of Georgia.

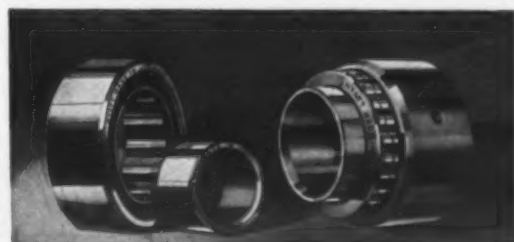
# IT'S A TOUGH LIFE



● Strategically located Hyatt Roller Bearings play a prominent part in the fine performance of BUCYRUS-ERIE SHOVELS.

## ...but they don't weaken!

# HYATT ROLLER BEARINGS



Under gruelling operating conditions today, excessive wear and stress is imposed, which would easily make ordinary bearings old before their time!

But Hyatt Bearings are designed to withstand these strains and shocks. And built by master craftsmen to a double standard of precision and long life—Hyatt capacity and performance give many added years of service to related parts.

That's why you will find so much operating equipment with Hyatt Roller Bearings built in. Hyatt Bearings Division, General Motors Corporation, Newark, Detroit, San Francisco. Hyatt Roller Bearing Sales Company, Chicago and Pittsburgh.

## LAYING BLACK TOP?



### JAEGER PAYER has 10 ADVANTAGES:

- 18 Ft. Movable Forms Give Smoothness of Concrete,
- 50% More Traction,
- No Load on New Material,
- Adjustable 9 to 14 Ft. Widths,
- Blends Perfect Joints,
- Capacity to 1000 Tons a Day,
- Lays Hot or Cold Bituminous, Stone or Macadam,
- Pug Mill Spreader,
- Less Hand Finishing,
- Automotive Construction,

Write for New Catalog, Prices.

THE JAEGER MACHINE CO.  
701 Dublin Ave., Columbus, Ohio

# JAEGER

### 1937 Dodge Trucks Have Cab Over Engine

Providing still greater economy, numerous mechanical improvements and a brand new capacity model, the Chrysler Corp., through its Dodge Division, is featuring cab-over-engine Dodge trucks and commercial cars. The new line includes 1/2-ton; 3/4-1-ton, an entirely new capacity model; and 1 1/2, 2, 3 and 4-ton trucks. The mechanical advantages of the 1937 model include

greater engine power, hydraulic brakes, fuel lines mounted on the outside of the frame, improved ventilation of the fuel pumps to reduce possibilities of vapor lock, an outside gasoline filler tube on cab models, longer rear springs and stronger safety steel cabs.

Special features on the 1/2-ton and the 3/4-1-ton models are: new and more powerful truck engines, truck transmissions, rubber insulated engine mountings on front and rear, vacuum spark advance and high compression cylinder heads. Outstanding on the 1 1/2 and 2-ton trucks

is the improved chassis frame which has X-type cross members at the rear of the frame and box-type cross members at the front.

The 3/4-1-ton truck, the new addition to the line, is offered in the following standard body models: flat faced cowl, cowl with windshield, panel, screen, canopy, cab and express. This new model was brought out for the purpose of permitting greater load capacity with approximately the same cost of operation as the smaller capacity hauling units.

### Marlow Pumps Announces Addition to Factory

Marlow Pumps, of Ridgewood, N. J., manufacturer of the Marlow Mud-Hog and self-priming centrifugal pumps, has announced that a new addition to its Ridgewood factory, increasing its capacity about 100 per cent, was recently put into service. In this factory are manufactured self-priming pumps from 2 to 8-inch in size and also generating units of 750, 1,500 and 3,000-watt capacity.



## STANDARD ASPHALT ROAD OIL



used to build seventy satisfying miles in one Michigan county

This figure is only typical of the thousands of miles of county roads that have been built throughout Michigan and the states served by Standard Oil Company (Indiana).

The satisfaction that these highways have given here is also typical of the feeling of highway officials and users who know this Standard Asphalt product. The satisfaction to highway officials lies in the greater mileage of improved roads its low cost affords—to users in the smooth, dustless, safe all-weather surface.

Your Standard Oil Company representative has information on types of construction and specifications best suited to the available mineral aggregate in your community, for use with Standard Asphalt Road Oil. See him before you spend any more highway dollars.

Copy, 1937, Standard Oil Co.

*Asphalt for every purpose*

**STANDARD OIL COMPANY**  
(INDIANA)

## Reports on Cotton Mats for Curing

### States Find That Cotton Mats, Furnished by BPR, Are Both Satisfactory and Economical

AS part of the Federal Government's \$1,300,000 program to demonstrate the practicability of cotton fabric reinforcing membrane in the construction of bituminous roads and of cotton mats for curing concrete pavement, twenty-three states last year asked for and received from the U. S. Bureau of Public Roads more than 89,000 mats. These mats, most of them approximately 22 x 6 feet, made of coarse cotton fabric and filled with 8 ounces of cotton per square yard, were distributed free to state highway departments which were willing to keep records of the results and pass on such records to the U. S. Bureau of Public Roads.

The states which received these mats included Michigan, North Carolina, Indiana, Minnesota, Missouri, New York, Arkansas, Illinois, Rhode Island, South Carolina, Arizona, Pennsylvania, Oklahoma, Wisconsin, Georgia, Washington, Nevada, Ohio, Mississippi, California, West Virginia, Texas and Oregon. Some of these states used the mats in their work of last summer and have already reported on the results while others received the mats too late to make any satisfactory tests last year but plan to use them in the coming construction season.

The Advanced Concrete Road Curing Co., of New Haven, Conn., and the Taylor Bedding Co., of Taylor, Texas, shared the contracts for the 89,000 mats of varying sizes which were furnished to the state highway departments by the Bureau of Public Roads.

#### Report From Texas

One of the most complete reports received was from Texas. The former standard practice of curing concrete in the Lone Star State was to cover the green concrete with wet burlap, followed by spreading with wet earth or by ponding. Either method required 10 days of constant attention, and the cost of curing ranged up to 4 cents per square yard. Using cotton mats, the Texas Highway Department found that concrete could be cured at a saving of from 15 to 25 per cent, plus the additional economy of being able to re-use the mats for seventy-five to one hundred placements.

Cotton-mat-cured pavement in two cases cited by the Texas State Highway Department showed compressive strengths of 5,030 and 4,438 pounds per square inch, compared with 4,587 pounds for a burlap-earth-cured section and 4,137 pounds for a burlap-ponded-water-cured pavement.

#### Minnesota Reports on Three Jobs

In Minnesota, cotton mats were tried out and reported on on three projects. The project engineer on one of these jobs reported very satisfactory curing qualities for the mats, mentioning that because the mats absorb water and retain it for a considerable time, adequate curing between sprinkling is assured. Another advantage he mentioned was the durability of the mats, making repeated re-use possible. A third feature mentioned was the protection to the green concrete against possible damage. He said,

"The quilted mat acts as a cushion in distributing the weight of a load or force of an impact. In one case this fall, I believe that mats saved our surface from permanent markings. A light car succeeded in passing barricades and was driven over pavement less than 24 hours old. Although the mats were deeply imprinted with wheel tracks, their cushion protection certainly prevented these wheel marks from carrying



Cotton-Textile Institute Photo

A Cotton Mat Used for Fifty-Eight Different Placements on Six Different Projects in a Period of 16 Months, for a Minimum of 72 Hours Each, and Which Was Dripping Wet for a Total of 352 Days. The Mat Is Still in Excellent Condition.

through into the pavement."

On the second project, the observations were that the mats are easy to handle, requiring only one man at each end. It was also found that the mats offered more protection to the concrete than other types of curing on the jobs

which extended into the autumn when the temperatures often were below freezing during the night.

Cotton mats were used exclusively for curing 5 miles of paving on the third project reported. The observations on

(Continued on page 53)

# Buckeye Clipper



with METERED VACUUM CONTROL

OPERATES AS EASILY AS DRIVING A CAR.

Every operation is maintained by a METERED VACUUM SYSTEM—never affected by temperatures, small leaks or water in the lines. The touch and feel of each lever, so essential to accurate operation, is there. All operator's movements are practically effortless. Swing brake sets automatically with the throttle in neutral. Rotation stops without reversing the swing clutches, eliminating excessive wear and overheating. You can swing, travel and hoist simultaneously. FOR THE OPERATOR'S CONVENIENCE, the Clipper has a big comfortable seat with thick cushion and a padded back rest, a hot water heater, compartment for personal articles, handy rack for tools most used, steel tool box, and pockets for order books and parts book. The Clipper has the handiest, most comfortable cab on any machine, with full vision safety glass windows—and it has METERED VACUUM CONTROL—giving ease of operation which means more yards of excavation with less fatigue.

THE LAST WORD IN EXCAVATOR ENGINEERING. A fast, compact, powerful, efficient, convenient and rugged machine, designed and built throughout to make you a profit. Send for literature or arrange to see the Clipper before you buy any 1/2 yard excavator this year.

THE BUCKEYE TRACTION DITCHER COMPANY, FINDLAY, OHIO

SHOVELS CRANES TRENCH HOES CLAMSHELLS DRAGLINES

### 3856 CONTRACTORS ARE USING "ANCHOR" PULLER JACKS



THERE MUST BE GOOD REASONS 3856 MEN CAN'T BE WRONG

Comes in handy on dozens of odd jobs. Capacity 3 tons single line; 5 tons two-line. Sheave block \$4.00 extra if desired.

MADE BY EDELBLUTE MANUFACTURING CO. REYNOLDSVILLE, PENNA.



C. &amp; E. M. Photo

A Typical Scene in Clear Creek Canyon

## A Canyon Highway— Denver Link to West

**Project in Clear Creek Canyon  
Will Be 15 Miles Long and  
Have 5 Tunnels**

A PIECE of heavy construction that has called upon the ingenuity of Location Engineers to the full and will require the maximum skill of contractors is now under way in Clear Creek Canyon, providing an improved outlet westerly from Denver and Golden, Colo. The entire project is approximately 15 miles in length and involves the construction of five tunnels. At present one section is under construction at the westerly end. This contract, WPH 81-F, Unit No. 1, is comparatively light work 0.998 miles long and is estimated to cost \$50,000.

Plans are now ready for 2,310 miles of construction extending the work now under way to a point below the Forks where the North Canyon enters Clear Creek Canyon. The proposed work involves two tunnels, one approximately 585 feet long and one approximately 1,300 feet long. These tunnels will provide a 24-foot width of roadway with a 4-foot sidewalk on each side, a total tunnel width of 32 feet.

The typical cross section for the roadbed in the canyon is 28 feet wide. Due to the presence of narrow-gage tracks of the C. & S. Railway in the canyon, over which millions of dollars worth of gold dredged from the creek bottom have been hauled out, 12 feet of the roadbed section will be used by these tracks until the railroad is finally abandoned. The grade of the highway is from 15 to 25 feet above the creek level.

The crowded condition in the canyon, the presence of the narrow-gage railroad tracks, the tunnel work and the steep rock cliffs through which the highway is to be constructed, result in an unusually difficult piece of construction.

### Estimated Quantities, Units 2 and 3

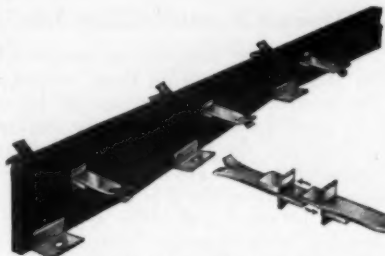
Item	Quantity
Unclassified excavation.....	196,000 cubic yards
Tunnel excavation.....	48,200 cubic yards
Tunnel enlargement excavation.....	1,400 cubic yards
Cut slope treatment.....	1.5 miles
Boulder excavation.....	3,000 cubic yards
Dry rock excavation.....	660 cubic yards
Dry common excavation.....	660 cubic yards
Wet rock excavation.....	260 cubic yards
Wet common excavation.....	260 cubic yards
Station yard overhaul.....	1,110,000 station yds.
Yard mile overhaul.....	28,000 yard miles
Untreated timber tunnel lining.....	267 M Ft. B.M.
Class A concrete.....	192 cubic yards
Class B concrete.....	45 cubic yards
Class A concrete (tunnel).....	1,732 cubic yards
Guniting coating.....	451 cubic yards
Cement for grout.....	120 barrels
Sand for grout.....	75 tons
Reinforcing steel.....	122,900 pounds
24-inch corrugated metal culvert pipe.....	296 linear feet
36-inch corrugated metal culvert pipe.....	418 linear feet
48-inch corrugated metal culvert pipe.....	148 linear feet
Project markers.....	2
Grout pipes.....	75

These quantities may vary somewhat, depending on final agreement on details.

Plans for the remainder of the canyon road are now in progress and will involve the driving of three more tunnels. The accompanying illustration was taken by the Editor during a trip over this projected work last summer through the courtesy of Charles D. Vail, State Highway Engineer, with Dan Ormsbee, Construction Engineer, Colorado State Highway Department.

### Double Plate Dowels For Expansion Joints

A new economical method of transmitting the load across expansion joints in concrete pavements to improve on the ordinary dowel bar has resulted in the Double-Dowel plate load transmission device of the Highway Steel Products Co., Chicago Heights, Ill. With this device, the load is carried on two 5/16-inch plates, placed one upon the other, each plate being 1½ inches wide. This pro-



An Installation of Double-Dowels and Details

vides a greater thickness of steel than with ordinary dowels and also a wider bearing surface.

These dowel plates are so constructed that when inserted in the joint filler they do not get out of alignment. The vertical metal faces hold the assembled units perpendicular to the filler. Their high load transmitting capacity makes it unnecessary to space them at closer than 20-inch centers in a 1-inch expansion joint.

The Double-Dowel is composed of two identical members which fit together into one complete unit. Each member is a combination of a 5/16 x 1½-inch plate, fabricated with a fishtail end to secure a strong anchoring bond in the concrete. To the smooth end of the plate is attached a specially designed sheet steel member that loops over the end, forming a box to provide a free space into which the other plate moves with the expansion and contraction of the slab and provides the vertical flanges which hold the unit perpendicular to the joint filler. The sheet metal member is made of 18-gage black sheet steel and is so constructed that it is held securely in position and will allow no movement.

The distance from the end of the plate to the vertical flange is 3 inches which allows 2 inches of the plate to extend in the adjacent slab when a 1-inch joint filler is used. The vertical flanges extend 2 inches above and below the bar on each side of the joint.

## ETNYRE "NON-DRIP" Circulating SPRAY BAR GREATEST IMPROVEMENT EVER MADE IN DISTRIBUTORS

● WHEN Etnyre engineers perfected the "Instantaneous Shut-Off" Spray-Bar, eliminating the uncertainty of "suckbacks," a most annoying problem was solved for Contractors and Highway Depts. It prevents "dripping or slobbering" on highways, intersections, cross-walks, etc. A clean cut starting and finishing line is positively assured by the Exclusive Etnyre valve-at-nozzle control of flow of material. Only in Etnyre Distributors—largest selling, most widely used in the world—can you get this great Bituminous Distributor feature. No clogging or congealing of materials—aspalt, tar, road oil, emulsion—in the Etnyre "Leakless Valve" Circulating system. Positive accuracy—simple, easy operation—full width distribution—superior double burner heating system—powerful rotary precision pump are other outstanding features of these famous distributors. Send for NEW catalog No. 506-B for complete information.

**E. D. ETNYRE & CO.**  
OREGON, ILLINOIS

DEALERS IN ALL PRINCIPAL CITIES



### tough going—but the Michigan is tougher!

Michigan Shovels are built for frozen ground—soft fills—gravel pits—rock quarries—mud—in fact, for anywhere a truck can navigate! . . . Although constructed for heavy duty and long life, the Michigan is not a ponderous, slow-moving machine. Its 25 mile-per-hour road speed gets it on the job and earning long before heavier equipment could be transported—and at a fraction of the cost . . . Model T-6 is faster in operation, too, due to fingertip air-controlled clutches and full-circle loading . . . Michigan's quick convertibility solves more of today's construction and maintenance problems than any other like equipment . . . Get Bulletin "C." Write—

MICHIGAN POWER SHOVEL CO., Benton Harbor, Mich.



100 PER CENT  
TRACTION

**DYNAMITE** ON WHEELS

FOUR POINT  
POSITIVE DRIVE



**T**HE WALTER SNOW FIGHTER, the snow-battling vehicle that has earned for itself the title of **DYNAMITE ON WHEELS** by reason of its performance under severe conditions in all sections of the United States and Canada, gives the user more than just four-wheel drive in plowing through mountainous heaps of snow—without faltering or halting.

A WALTER MOTOR TRUCK is more than a four-wheel drive truck; it is a Four-Point Positive-Drive Truck. A four-wheel drive truck, in hard going, can and must slip two wheels while the other two stand still—**RESULT—50% Traction**. A WALTER TRUCK is equipped with three automatic locking differentials, which does not permit one, two or three wheels to spin or slip while the others stand still—**RESULT—100% Traction** at all times under any and all conditions.

#### GENERAL USE

A WALTER SNOW FIGHTER not only sees service in the winter. The plow can be removed from the truck and the unit can be used for general service. WALTER MOTOR TRUCKS are used in the oil fields of Texas and Oklahoma, for logging on the Pacific coast, and for general transportation at a low operating cost per mile. WALTER TRUCKS are good in any soft going. They always assure the user of the delivery of his cargo.

# Walter Motor Truck Company

1001-19 IRVING AVE.  
RIDGEWOOD, QUEENS, L. I., N. Y.

## Dual-Type Paving On 5.6-Mile Pa. Job

(Continued from page 18)

pump with Hercules power to supply water to a 2-inch line laid the entire length of the job. Valves were spaced 275 feet apart and the paver carried 300 feet of hose.

A crew of five men taken from the fine grade crew pulled the forms and hauled them forward. A plow and then a power grader were used to throw earth against the slab to protect the edge after the cotton mats were removed.

The concrete slabs were poured with no crown but with a slope of 1 inch in 10 feet to the shoulders. The paver was warped over old belting when it was run on the new pavement, to protect the surface from scarring.

### Drainage of Center Lane

In order to prevent any accumulation of water underneath the bituminous center lane, the plans and specifications called for two lines of 4-inch bell and spigot tile on grades and at every low spot. This tile was laid with loose joints 6 inches away from each slab in 200-foot sections, spaced 500 feet apart. Two lines of tile were also laid on the inside of all super-elevated curves. Each of these pipe drains was connected to culverts or previously laid drains beneath the concrete slab. The drains laid just below the subgrade were back-filled with 1 1/4-inch stone.

### Placing of Base Stone

The 8-inch base course of crushed aggregate in the center lane was laid in two 4-inch compacted courses. The subgrade was first rolled with a 10-ton Huber 3-wheel roller, then checked with several scratchboards and brought to accurate grade by a crew of fourteen men. The crusher-run stone, of maximum 4-inch screen size, was hauled from the same quarries which furnished the concrete aggregate by a fleet of hired trucks and then spread by the trucks dumping into and pulling 8-foot Burch stone spreaders. Two men worked on the spreader box and then two men with rock forks touched up the surface. Behind them, after the Huber roller had compacted the stone, two men checked the surface with a crown-board. The bottom course of the base was filled with dry screenings of maximum 5/8-inch screen size. Hand brooming was used to touch up and then a gang broom was pulled over by the roller.

The top course was laid in exactly the same manner as the bottom course but was grouted with wet screenings, finishing the top 4-inch layer of the base course as a water-bound macadam.

### The Bituminous Surface Courses

The surface course consisted of 1 3/4 inches of FB-1, aggregate averaging 1 1/4 inches screen size mixed 30 seconds cold with emulsified asphalt in a pug mill. The plant of the York Valite Co. at Williams Grove, Pa., was used for the preparation of this material. The cold-mix was spread 1 3/4 inches loose and allowed to set for 24 to 36 hours before rolling. It was laid down with a Jaeger spreading machine and after setting was rolled with a 8-ton tandem or a 10-ton 3-wheel roller. Because of the fact that all of this material was being rolled in the trough between the two concrete slabs, only longitudinal rolling was possible. The finished course consisted of 1/2-inch of Kentucky rock asphalt.

The heavy clean-up along the shoulders and ditches was done with a Caterpillar Thirty equipped with a LaPlant-Choate hydraulic bulldozer.

### Quantities

The major quantities on this contract were as follows:

ITEM	QUANTITY	UNIT	PRICE
Unclassified excavation.....	61,666 cu. yds.		\$ .46
Bridge and ditch excavation, hand.....	2,804 cu. yds.		1.60
Subgrade preparation.....	83,009 sq. yds.		.11
Shoulders.....	308.0 lin. ft.		.15
Crushed aggregate base course, 6-inch, for road approaches.....	3,199 sq. yds.		.60
Crushed aggregate base course, 8-inch.....	19,513 sq. yds.		.70
Reinforced concrete pavement, 10-8-10, dual pavement.....	39,026 sq. yds.		2.19
Reinforced concrete pavement, 10-8-10, 20-foot pavement.....	27,291 sq. yds.		2.23
Reinforced concrete bridge surfacing, 2 1/2 inches thick.....	144 sq. yds.		2.25

Bituminous surfacing, FB-1, emulsion, 1 1/2 inches thick.....	21,747 sq. yds.	.39
Bituminous surfacing, rock asphalt, 1 1/2-inch thick.....	21,747 sq. yds.	.41
Bridge concrete, Class A.....	106 cu. yds.	18.00
Bridge concrete and headwalls.....	878 cu. yds.	15.00
Steel bar reinforcement.....	42,875 lbs.	.035
14-inch cast iron pipe.....	122 lin. ft.	2.90
16-inch cast iron pipe.....	112 lin. ft.	3.15
18-inch cast iron pipe.....	126 lin. ft.	3.40
24-inch cast iron pipe.....	352 lin. ft.	3.65
15-inch corrugated metal pipe.....	696 lin. ft.	1.75
18-inch corrugated metal pipe.....	858 lin. ft.	2.10
24-inch corrugated metal pipe.....	28 lin. ft.	3.00
30-inch corrugated metal pipe.....	12 lin. ft.	4.00
15-inch reinforced concrete pipe.....	810 lin. ft.	2.25
18-inch reinforced concrete pipe.....	1,125 lin. ft.	2.90
24-inch reinforced concrete pipe.....	112 lin. ft.	3.75
30-inch reinforced concrete pipe.....	330 lin. ft.	5.00
4-inch tile.....	530 lin. ft.	.70
4-inch tile, foundation under-drain.....	2,754 lin. ft.	.60
4-inch tile, outlets.....	1,986 lin. ft.	.60

### Personnel

On this project, the contractor was able to complete between 1,200 and

1,500 feet of one course of the center lane per day of 13 hours and between 1,100 and 1,200 feet of 10-foot concrete slab. The job was operated in two 6 1/2-hour shifts with a 40-hour week and no limitation on the number of hours worked per day. H. W. Shaull & Son of Mechanicsburg, Pa., was the contractor, with Clyde Shaull in direct charge of the work. C. I. Barner was Resident Engineer for the Pennsylvania State Department of Highways.

A novel machine for laying hot-mix widening strips, developed by Hemstreet & Bell in California, will be described in our May issue.

# Good Roads




Above—Good Roads 50 ton mounted bin with vibrating screen and 18" return belt conveyor.

Left—Good Roads No. 1020 Rock Crusher mounted with 26 foot bucket elevator and power unit.

Left below—Good Roads 50 foot portable belt conveyor with reciprocating feeder.

**"GO PORTABLE" for PROFIT . . . !**

Save yourself the cost of hauling in aggregate and increase operating economy by owning a portable crushing plant. You can get a plant specially designed to meet your own requirements. Complete information will be sent you free of charge. Write for Bulletin C-4371.

**GOOD ROADS MACHINERY CORP.**  
Kennett Square, Pa.

## Dumps Any Load Anywhere - Anytime!



HOISTS - BODIES - TANKS  
ROAD SCRAPERS - SNOW PLOWS  
BOTTLE WASHERS - DEHYDRATORS  
OIL BURNERS - WATER SYSTEMS

Heil hydraulic dump units are designed and built to perform under the toughest kind of dumping conditions . . . Extra reinforcements where needed and great structural strength insure dependable operation . . . No matter what your hauling problem is you will find exactly the type of equipment you need in the complete Heil line . . . See your nearest Heil representative or address:

**THE HEIL CO.**

GENERAL OFFICES: 3000 N. MONTANA ST., MILWAUKEE, WISCONSIN

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BRANCHES AND DISTRIBUTORS EVERYWHERE

### MUNICIPAL SALES AGENTS WANTED

To sell on liberal commission basis—Street Signs, Traffic Signs, Reflector Signs and Signals, Highway Beacon Lights.

**MUNICIPAL STREET SIGN CO.**

221 Meeker Ave., Brooklyn, New York

## Driving Tunnels With Explosives

In all the annals of blasting, there is perhaps no story more graphic than that of the men whom dynamite helped to drive tunnels. When the Black Rock tunnel of the Philadelphia & Reading Railroad was built in 1835, hand labor and black powder enabled the blasters to advance through hard rock at the rate of 1½ to 2 feet a day, or 20 to 50 feet per month. Contrasted with this is the record at the Cascade Tunnel in Washington, built in 1925-29. Its consumption of explosives ran around 27,000 pounds of gelatin dynamite a month, with a maximum monthly progress of 1,157 feet. This tunnel was 16 x 24 feet in size, and for three months averaged more than 1,100 feet advance per month, a world's record.

The advance to that speed of tunnel driving was slow, but steady. The Hoo-sac Tunnel, 3¾ miles long, completed in 1873, at first consumed nearly 1,000 pounds of black powder a month, and was advanced as fast as 70 feet a month while using this explosive in holes 30 inches deep. Later, when the builder resorted to the use of liquid nitroglycerin, their progress was speeded up to 154 feet a month.

Meanwhile, work was begun on the mile-long Musconnetcong tunnel near Easton, Penna., the first big job of its kind on which dynamite was used extensively and successfully. The bore was started in 1872 with black powder. But the rock was hard and progress so slow that any prejudice still entertained by the builders against dynamite quickly vanished, and soon they were making 135 feet a month through extraordinarily tough resistance. In this tunnel, after

the first year, 28,000 pounds of kieselguhr dynamite and 140,000 pounds of active dope dynamite were used.

But real speed through any kind of going awaited the development of gelatin dynamite. And the speed made possible by this development has already been cited in driving Cascade Tunnel.

The 16-foot diameter Chicago water

tunnels now being driven will regularly advance more than 14 feet per shot, using gelatin dynamite.

Possibly the greatest tunnel-driving feat of all will be the completion in 1938 of the Colorado River Aqueduct, which will carry water to Los Angeles and twelve other cities comprising the Metropolitan Water District of Southern

California from Parker Dam, 240 miles away. This aqueduct will include 92 miles of tunnels 18 feet in diameter. More than \$60,000,000 will be spent on the tunnels, of which there are twelve. One will be 18 miles long, another 15 miles and another 13 miles. They are designed to supply 1,000,000,000 gallons of water a day.

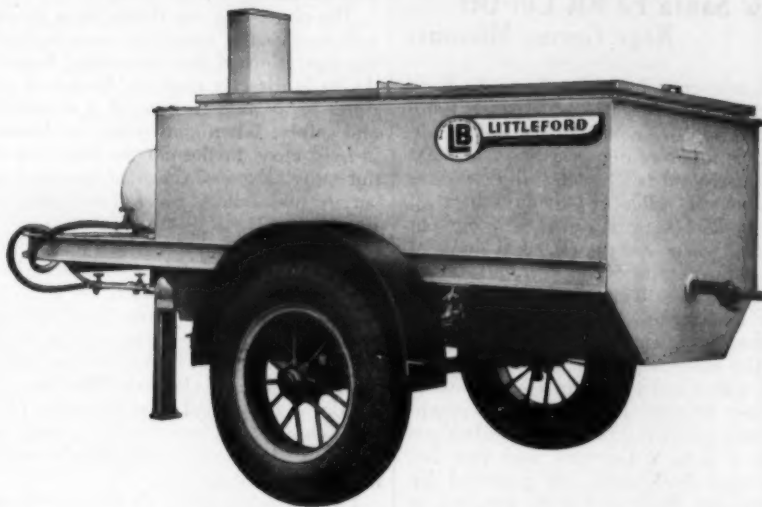
## Announcing a New 300-Gallon Kettle

This No. 84-HD6 fills a need felt by many maintenance departments for an economical heater that will heat large quantities of any type of bitumen quickly. A kettle that is made along modern lines—that is not too heavy, yet built to stand years of hard use on all kinds of work.

The actual capacity of this unit is approximately 350 gallons. It has Littleford "double heat circulation" and the same inverted V type screen in the reservoir that has proven so successful in other sized models of the favorite Littleford No. 84-HD Heater.

Use this kettle with the new Littleford Motor Spray Attachment for turning out plenty of work—or the Hand Driven Handspray.

Write, now—don't delay—ask for prices and full specifications.



The Littleford No. 84-HD6.

**LITTLEFORD**  
Road Maintenance Equipment  
SINCE 1900

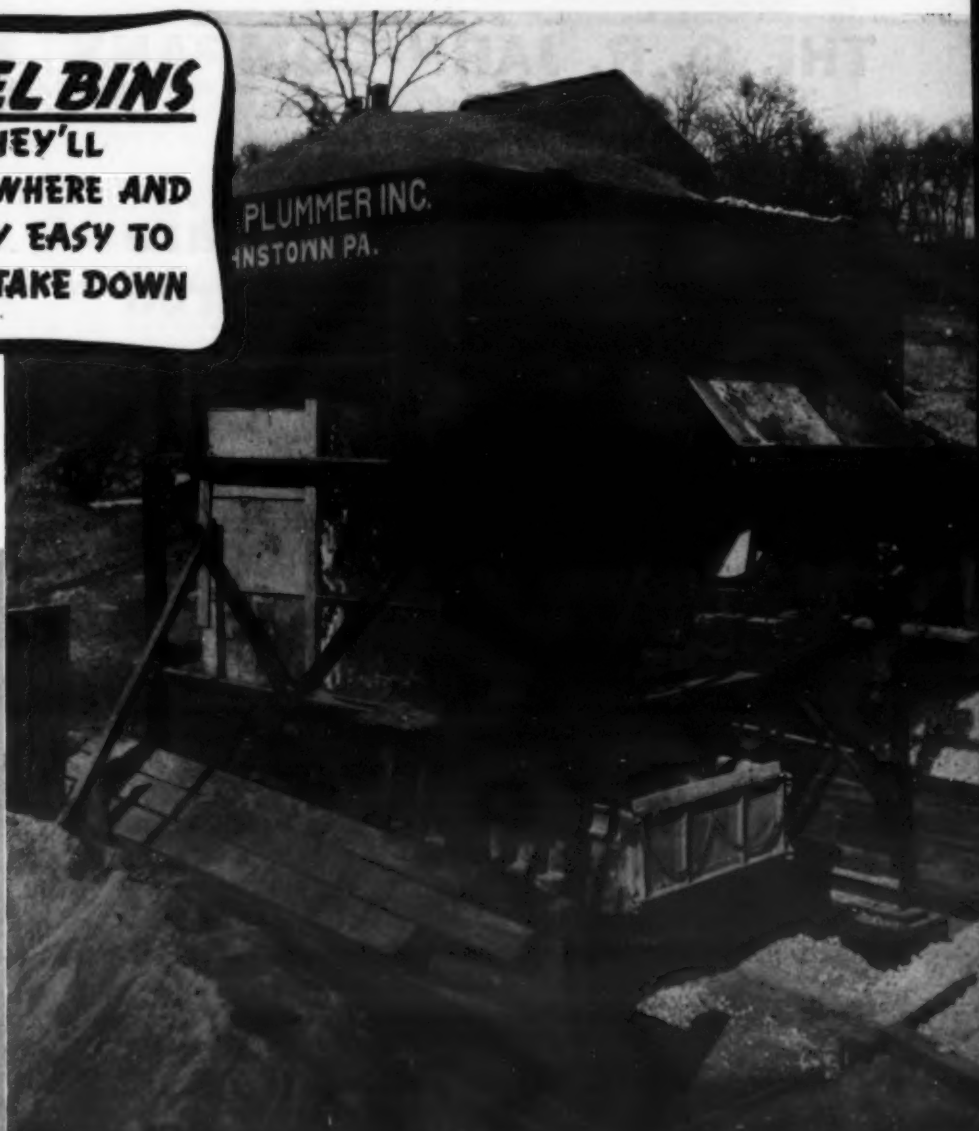
LITTLEFORD BROS., 485 E. PEARL ST. CINCINNATI, O.



**HELTZEL BINS**  
FOR US - THEY'LL  
TRAIL ANYWHERE AND  
ARE MIGHTY EASY TO  
SET UP AND TAKE DOWN

Long hauls and rough country do not trouble the contractor who uses Heltzel Trailer Type Bins. Heltzel Bins are made for hard service. They combine greatest strength with exceptional erecting and dismantling ease, and remain true and accurate in function for years of exacting use. As Heltzel customers are the first to point out, "You save in set-up and take-down time—you save on maintenance costs—you satisfy every engineer's requirements for accurately proportioned aggregates when you use Heltzel Bins."

The story of Heltzel bin construction is informative. Let us send you the details.



**THE HELTZEL STEEL FORM & IRON CO., WARREN, OHIO**

Manufacturers of: Central or Truck Mix Plants; Bulk Cement, Storage and Batching Bins; and Large Stationary Storage Bins for Coal, Sand and Stone



Making the New Railroad Cut Along-side the Old

### New Santa Fe RR Cut-Off Near Gorin, Missouri

A new cut-off for the Santa Fe Railroad, near Gorin, Mo., for which Cameron & Joyce, Keokuk, Iowa, is the contractor, involves the excavation of 360,000 cubic yards of material. Sections of about 4 miles are being relocated. The bulk of the excavation is in one cut which, when completed, will have a maximum depth of 50 feet, and from which 226,000 cubic yards of dirt will have been removed.

The equipment on this project to handle the material, which is chiefly heavy clay with a light shale in spots, consists of three 12-yard Type J Carryall scrapers, two 12-yard Type Y Carryalls, one Type J 6-yard Carryall and two Le-Tourneau bulldozers, all powered by Caterpillar RD8 and RD7 tractors, a Carr scarifier and an Austin-Western elevating grader.

The work is being done in two 11-hour day shifts. W. D. Weiss is Superintendent for the contractor.

### A Conveying Excavator For All Trench Work

The Moretrench conveying excavator takes up but little room in the streets and handles all digging, hoisting, conveying and backfilling operations. It is mounted on tracks so that it may be moved along easily on the sides of the trench to keep pace with the progress of the work. The Model C excavator, with a standard length of 288 feet, is composed of eight coupled sections, each section being 36 feet long.

The conveying car riding on a mono-rail carries the attendant who controls the operation of the excavating bucket. As he is directly over the bucket at all times he is able to control it carefully and safely. When conveying, the bucket is held close to the car so that it does not sway. Excess excavated material is carried to the end of the unit and dumped into trucks.

The conveying car carries a heavy fall block for handling heavy concrete pipe. Its movement is controlled by a drum arrangement which gives great lifting power. The machine picks up the pipe, carries it along and lowers it into place. There is sufficient clearance beneath the trestle of the Model C machine to permit vehicles and machines as large as switching locomotives to pass beneath, thus not impeding traffic.

Further information on this excavator may be found in the Moretrench catalog, copies of which may be secured direct from the Moretrench Corp., Rockaway, N. J. by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### A Hercules Roller *Plus* a Hercules Ironer Roll

gives  
"Plus" Performance!  
Let us explain  
**WHY**



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HERCULES CO.  
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**15% to 25% MORE PROFIT**  
*from your Dragline Machine*  
**with a PAGE AUTOMATIC!**

#### Read The Reports Of Automatic Users:

##### One Contractor writes:

"We were amazed at the way the AUTOMATIC bucket handled the hard material especially on the slopes. We feel sure that we can figure an increase of 25% in yardage with the AUTOMATIC. We hope to be in the market for additional AUTOMATICS in the future."

##### Another User says:

"Our work was completed in three months—one-half the time we figured necessary. We find the AUTOMATIC bucket the most practical and profitable bucket to use on our type of excavation work."

*\*From letters in our files.*

Ask other AUTOMATIC owners of their results with this patented rounded front bucket. Then see your equipment dealer or write us direct for information on an AUTOMATIC best suited to your machine and job. *Always remember*—as a profit earning tool, your dragline machine is only as good as the bucket you use!

BUILT  
IN SIZES  
3/8 to 15  
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# NOTICE!

## THE C. R. JAHN COMPANY

*Announces*

**that their trailers are  
now being manufactured  
in CHICAGO**



This new arrangement makes improved manufacturing facilities possible, assuring better workmanship and a better product.

It enables us to offer a superior trailer at lower costs.

The central location of Chicago provides for lower freight rates and prompt delivery.

If you are in the market for a heavy duty machinery trailer, it will be to your advantage to investigate the improved features that these trailers offer.

**THE C. R. JAHN COMPANY**  
BUILDERS BUILDING  
CHICAGO ILLINOIS

## State Highway Depts. Report on Cotton Mats

(Continued from page 47)

this job were similar to those on the others, the durability of the mats and their serviceability in protection against freezing temperatures being mentioned particularly. It was also reported that the outside edges of the concrete slab were banked with earth over the ends of the mat with no apparent harm to the latter.

### Illinois' Report

In Illinois, the cotton mats were used on three different projects, the largest being 33,000 square yards of pavement. The labor cost per square yard for curing with concrete mats was found to be 11/3 cents. From the construction standpoint, a preference for the cotton mats was recorded, as they were also found to be excellent to prevent freezing of the subgrade.

In measuring the durability of the mats, it was found that 95 per cent were apparently still in very good condition after curing more than 30,000 square yards of pavement, whereas other materials used to cure another project involving the same amount of pavement were completely worn out.

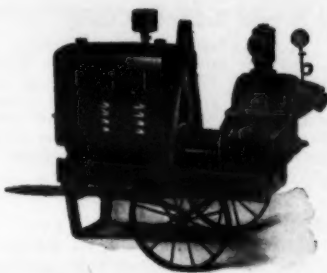
### Other States Agree

W. W. Zass, Chief Engineer of the Arkansas State Highway Department, wrote that the mats used for curing 180,000 square yards of concrete pavement were found satisfactory there and Michigan was so satisfied with the results that the state specifications now provide for the use of mats as a method of curing.

In Wisconsin mats were used on 8 miles of concrete paving, and in West Virginia, on two 10-foot lanes, slightly less than 5 1/4 miles long. In the latter state, reports indicate that the cotton mats are more serviceable and durable than other materials and their curing qualities proved satisfactory. It was noted that they retain moisture for a longer period.

According to reports from Indiana, cotton mats were used on three projects and they served very well as a curing agent.

"Highways should not be built for the vehicles alone but for the passengers in the vehicles as well."—A. T. Greenfelder.



The New Marlow 4-Inch Pump

### New High-Capacity Pump Mounted On Trailer

A new 4-inch centrifugal pump rated at 40,000-gph, according to the Con-

tractor's Pump Manufacturers Association Standard Ratings, has been announced by Marlow Pumps, Ridgewood, N. J. This pump is powered with a 3 1/4 x 4-inch Model FCU Waukesha engine and is mounted on a 2-wheel spring trailer with steel wheels, or pneumatic wheels if ordered specially.

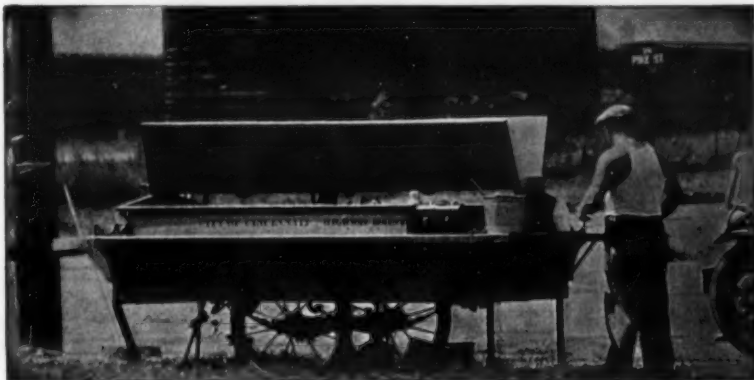
One of the features of the pump is the accessibility for cleaning, there being a hand-hole plate on the suction side so arranged that it may be opened for the removal of trash in the suction housing without stopping the pump and without losing the priming water, according to the manufacturer. Another hand hole at the back of the pump permits access to the automatic recirculation valve which is provided to stop recirculation of water automatically as soon as the

pump is primed. The pump is of the self-cleaning type with three-vane trash-type open impeller.

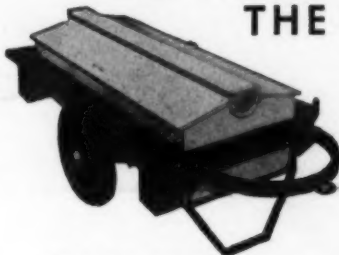
## THORNTON Four Rear Wheel Drive SPEEDS UP THE WORK FOR CONTRACTORS



Thornton-Ford tractor hauling 22-ft. Machinery Trailer carrying 16-Ton "Caterpillar".



### A WORK BENCH ON THE JOB THE LB HANDEE BOX



This all steel trailer type tool box will outlast two wooden boxes. Costs less in long run than homemade units.

The HanDee Box has a place for every tool, fitting, first aid kit and foreman's record. Vandals can't steal your tools—in fact, it is as safe as a safe. The only way it can be opened is with the Yale lock key provided. Lighter than wood boxes—easier to maintain—lasts longer. Shelves on all sides provide suitable work benches on the job. Two sizes in each of two models. Ask about it, now.



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WRITE for full data on the Thornton Drive and how it enables a Ford or Chevrolet Truck to handle such large loads, with better traction, flotation and rim pull, and at greatly reduced operating cost. Time payments. A.M.A. warranty.

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### Better Bulldozer Performance

Until you experience the smooth and accurate performance of the simply-constructed, direct lift Baker Bulldozers and Grade-builders, you will not know real economy in bulldozing operations. Tremendous down pressure, high lift and great strength, together with long life and extremely low repair costs are reasons for the wide use of Bakers on important construction projects.

Model 215 Bulldozer on Model "L" A.C. Tractor digging dirt for viaduct abutments City of Middletown Connecticut



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N. B. A dollar bill, check or postage stamps will be entirely acceptable.

## Bulletins and Pamphlets

For free distribution to contractors, engineers and officials. Write for the catalogs you need.

### Condensed Catalog on Road Equipment

128 A new condensed catalog of Adams road equipment, illustrating and describing briefly Adams leaning-wheel graders, heavy-duty motor graders, elevating graders, the Adams retread paver, and the new No. 20 motor grader, the purpose of which is to acquaint readers with the range and features of Adams equipment, may be secured by interested contractors, state and county highway engineers direct from the J. D. Adams Co., Indianapolis, Ind.

### Wood Sole Sandals for Workmen

129 The Davenport wood sole spiked sandal for protecting the feet of workmen from burning by hot asphalt as well as for preventing footprints on freshly-laid asphalt paving is described and illustrated in literature which may be secured direct from the F. J. Stahmer Shoe Co., Davenport, Iowa.

### Semi-Portable Crushing Plants

130 Complete information on Good Roads semi-portable crushing plants, which are assembled to meet the special requirements of a job at no extra cost and include for a typical job a Good Roads portable belt conveyor, revolving screen, Champion bins and roller-bearing jaw crusher, may be secured by those interested direct from the Good Roads Machinery Corp., Kennett Square, Penna.

### Light-Weight 3/4-Yard Excavators

131 Complete information on Lorain-40 excavators, which offer 3/4-yard capacity at practically 1/2-yard weight, the features of which are stability and strength, may be secured from the Universal Crane Co., Lorain, Ohio.

### Heavy-Duty Trailers

132 Jahn heavy-duty machinery trailers, which are fully-reversible, have brakes on all wheels, and are made in a variety of types and capacities, are described in literature which the C. R. Jahn Co., LaCrosse, Wis., will be glad to send on request.

### Wellpoints and Pumps

133 The Griffin Wellpoint Corp., 725 East 140th St., New York City, will be glad to send complete information on Griffin wellpoint systems, including Jet N' Drive wellpoints and Griffin Vac-U-Matic pumps, for making that wet job dry.

### A Snappy Welding Catalog

134 An attractive catalog on the new 40-volt Simplified Electric Arc Welder has been issued by Hobart Brothers Co., Box FR-173, Troy, Ohio. It contains many illustrations of various jobs which this new welding outfit can handle, as well as a complete description of the line with specifications.

### Increasing Truck Capacity

135 Complete information on the Thornton Four Rear Wheel Drive, which makes a heavy-duty unit of a standard 1 1/2-ton truck, may be secured from the Thornton Tandem Co., 5153 Braden St., Detroit, Mich.

### Trailer-Type Bins

136 Heltzel trailer-type bins, in a capacity range of from 17 to 103 cubic yards, for batching one, two or three aggregates and/or bulk cement, are described in literature which may be secured from the Heltzel Steel Form & Iron Co., Warren, Ohio.

### Plywood for Concrete Forms

137 Super-Harbord, in waterproof panels for use as concrete forms, which is guaranteed against ply separation and which may be used as many as 55 times, is made by the Harbor Plywood Corp., Hoquiam, Wash., which will be glad to send full information on request.

### A Concrete Vibrator Catalog

138 Concrete vibrators with a size and type for every job are described in an illustrated folder, Form 1137, which has just been issued by the Mall Tool Co., 7740 So. Chicago Ave., Chicago, Ill.

### Complete Asphalt Plants

139 Standard Steel Works, 5001 Boyle Ave., Los Angeles, Calif., will be glad to send on request complete information on Standard asphalt plants which are completely sectionalized for moving from one job to another.

### Free Pictorial Reference Catalog

140 A well-illustrated 24-page catalog, describing and depicting on the job the Austin-Western line of road building, earth handling, rock crushing and snow removal equipment for contractors, state and county highway departments, may be secured without obligation from the Austin-Western Road Machinery Co., Dept. Y, Aurora, Ill.

### Heavy Ripper Saves Blasting

141 Heavy-duty rooters built to rip up the toughest material, such as sandstone, decomposed shales and granite, hard pan, cemented gravel and macadam, making it possible to move it by scrapers without blasting, are described in Form No. R-304 recently issued by R. G. LeTourneau, Inc., Peoria, Ill., and Stockton, Calif.

### Air-Cooled Engines For Heavy Trucks

142 The Doman-Marks air-cooled engine, which is built especially for heavy-duty service and operates as well at 20 degrees below as at 90 degrees above, is designed particularly for replacement units in hard-working motor trucks on construction and highway work. Details of Doman-Marks features and performance records may be secured from Doman-Marks Engine Co., Inc., Liverpool Road, Syracuse, N. Y.

### Truck-Mounted Road Maintainer

143 The Burch Corp., Crestline, Ohio, will send on request complete information on the Burch Undr-Truk road maintainer which is easily hooked on to the truck in 3 minutes and is controlled hydraulically.

### A Trailer for Every Job

144 Information on Rogers trailers, in sizes of 5 to 100 tons, a type for every job, large or small, may be secured from Rogers Bros. Corp., Albion, Penna.

**TENTS  
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The Fulton line is sold through Contractor Supply Dealers in every state. A quality line priced right. Ask for SHUREDRY and FULTEX Tarpaulins, Tents, Windbreaks.

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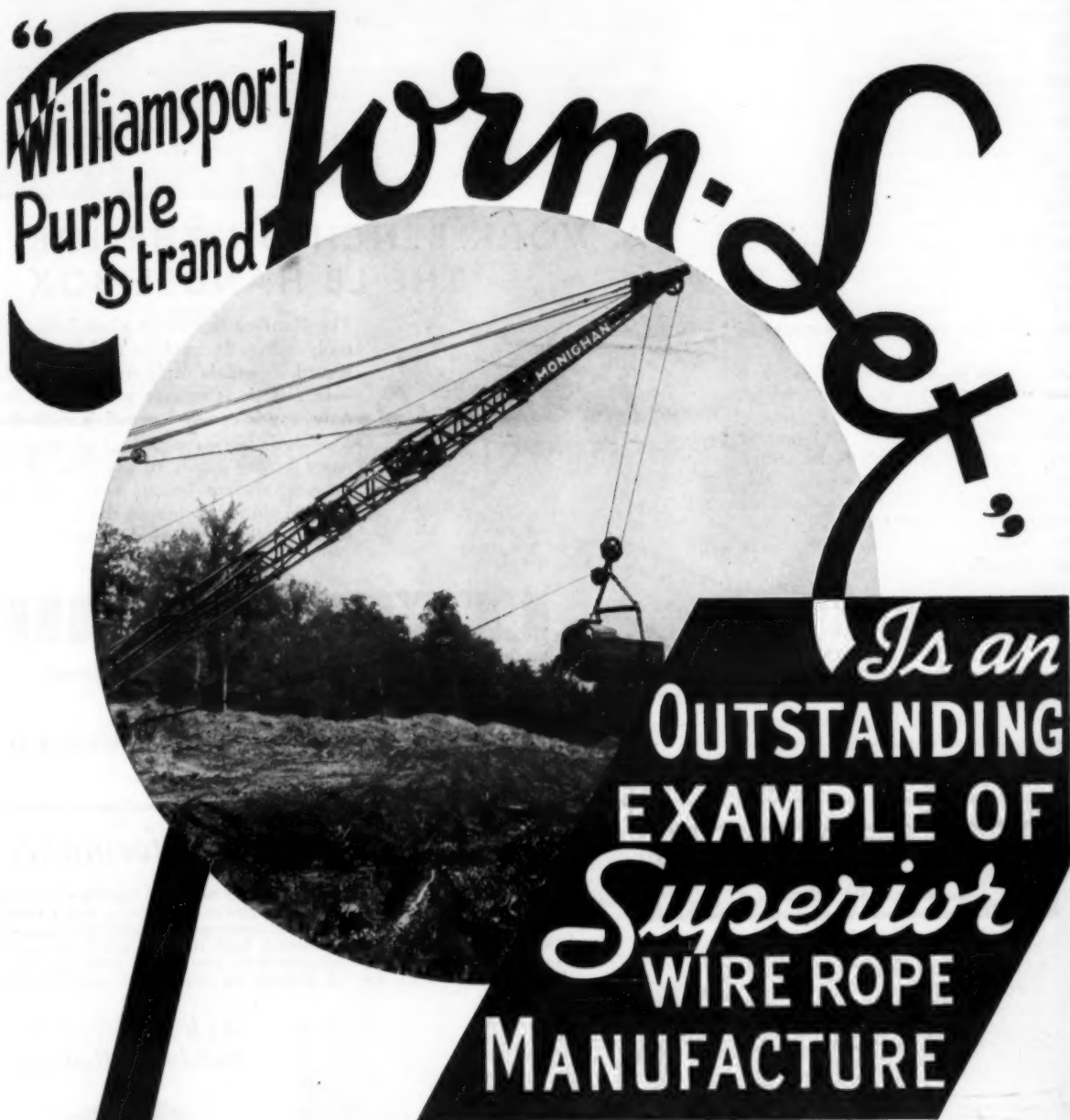
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## Bulletins and Pamphlets

(Continued from preceding page)

### New Vibrating Screen Catalog

145 A new 24-page illustrated catalog No. 1562, complete with clearance diagrams and dimension tables, has been issued by the Link-Belt Co., 307 No. Michigan Ave., Chicago, Ill., on its two types of vibrating screens UP and PD for accurately screening materials. Copies of this catalog may be secured direct from the company by mentioning this magazine.

### New Arc Welding Technique

146 This is the title of a new 20-page booklet describing and illustrating the new Lincoln Shield-Arc S.A.E. welder and its applications to construction and repair work. Copies of this Bulletin 412 may be secured without obligation direct from the Lincoln Electric Co., Cleveland, Ohio.

### Manganese-Vanadium Steel

147 Manganese-Vanadium steel, a new alloy high-strength steel, for plates and structural shapes, which possesses high strength and ductility in the as-rolled condition is described in a new bulletin which may be secured direct from the Vanadium Corp. of America, 420 Lexington Ave., New York City.

### Earth-Moving Equipment

148 The Slusser-McLean Scraper Co., 248 Poplar St., Sidney, Ohio, will be glad to send complete information on its line of earth-moving equipment, including all types of wheelbarrows, drag, Fresno and wheeled scrapers, grading plows and rippers, scarifiers, rippers and bulldozers.

### Gas or Electric Vibrators

149 Baily Vibrator Co., 1526 Wood St., Philadelphia, Pa., will be glad to send to those interested complete information on its line of Baily concrete vibrators, including vibrating screeds and rollers for concrete pavement, the immersion-type vibrator, the one-man portable internal or surface type, and the joint vibrator.

### New Trucks Cut Hauling Costs

150 The Dodge Division of Chrysler Corp., Detroit, Mich., will be glad to send to those interested information on the new Dodge trucks which, according to the manufacturer, are setting records in reducing hauling costs.

### Simple, Rugged Self-Priming Pumps

151 Sterling self-priming centrifugal pumps, the patented construction of which permits the use of three-blade streamlined open trash-type impellers, are described in literature which the Sterling Machinery Corp., 411-13 Southwest Blvd., Kansas City, Mo., will be glad to send on request.

### Traveling Road-Mix Plants

152 The Cedar Rapids traveling Road-Mix plant and the Cedar Rapids Rapidmix plant, for building black-top roads at low cost, are described in literature which the Iowa Mfg. Co., Cedar Rapids, Iowa, will be glad to send to interested contractors, state and county highway engineers.

### Steel Pile Shells for Concrete Piles

153 Union Metal fluted steel pile shells, cold rolled for tapered cast-in-place concrete piles, are described and illustrated in a new bulletin which interested contractors and engineers may secure upon request from the Union Metal Mfg. Co., Canton, Ohio.

### Socketing Wire Rope

154 One of the handiest booklets for any construction man using wire rope has been issued by the Union Wire Rope Corp., 21st and Manchester, Kansas City, Mo., on the socketing of wire rope. It shows by large, clear pictures different methods of making sockets and the results of tests on each type of socket. This book may be secured free by mentioning CONTRACTORS AND ENGINEERS MONTHLY.

### Calcium Chloride for Curing

155 High-early-strength, and the other advantages of adding calcium chloride to the concrete mix, is discussed in literature on the use of calcium chloride in concrete which may be secured from the Dpw Chemical Co., Midland, Mich.; the Michigan Alkali Co., 60 E. 42nd St., New York City; Solvay Sales Corp., 40 Rector St., New York City; or the Columbia Alkali Corp., Barberton, Ohio.

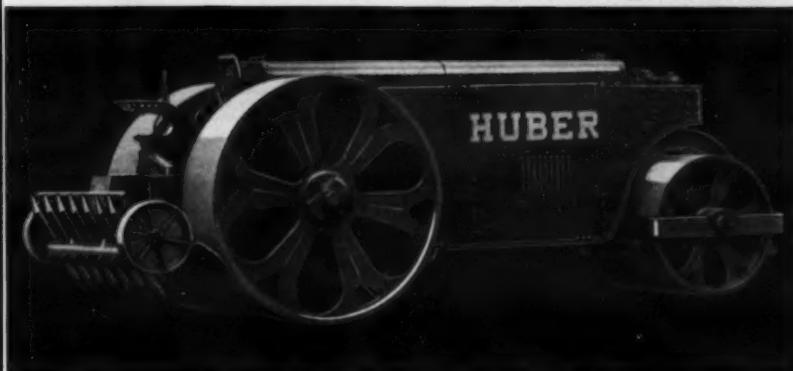
### A New Workshop Lathe

156 The new 1937 model 9-inch workshop precision lathe, in seven different styles to suit varying requirements of installation, is described in a new 24-page catalog which may be secured free upon request from the South Bend Lathe Works, South Bend, Ind.

### New Air Compressor and Power Unit

157 The W-K Mogul V-8 combined air compressor and power unit, which utilizes two Ford V-8 engines, one for power and one for air, and which is a portable unit equipped with plug-in lights for night work, is described and illustrated in literature which may be secured direct from the W-K Manufacturing Co., Southwest Blvd. & Central St., Kansas City, Mo.

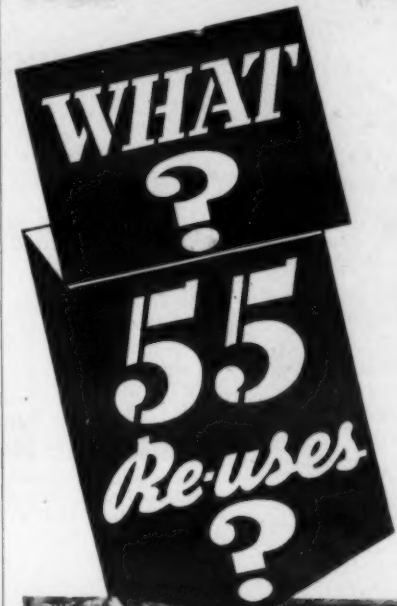
# HUBER DIESEL



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The Huber Diesel offers you every Motor Roller advantage: low first cost, low fuel cost, low up-keep cost. It is modern, practical, dependable. Its smooth operation adds quality to the work you do. Its oversize construction adds long-life to the roller. Investigate the Huber Diesel today. Send for FREE DESCRIPTIVE BULLETIN.

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Just ask  
**JOHN KERNS**  
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about  
**SUPER-HARBORD**  
for concrete forms

Contractors all over the country have been re-using Super-Harbord Plycrete Panels from 8 to 30 times, but here's a construction man who shows what these WATERPROOF panels will actually do. Read his letter—it simply radiates cost-cutting and satisfaction.

JOHN KERNS CONSTRUCTION CO.  
Contractors of Public Work

Harbor Plywood Corporation,  
Hogiam, Washington.  
Dear Sirs:  
We recently completed the Indian Creek Flood Relief P.W. A. Project No. 1008-2 at Council Bluffs, Iowa.  
This work entailed the building of 11700 lin. ft. of 10 ft. wall and 9000 lin. ft. of 13 ft. wall. We purchased from your company 18,000 feet of Harbor Super Plycrete using only 15,000 feet made into panels of 4' x 10' and re-making these into 4' x 13', a total of 600 lin. ft. of 4' panels. As you can readily see this material was used from 80 to 95 times, and after the Project was completed we used the Plywood Panels to build storage sheds. Harbor Super Plycrete did not show any signs of ply separation and in our opinion will last until it is completely worn out.  
We not only recommend Harbor Super Plycrete for form material for its many re-uses, but it leaves a smooth finish which takes very little if any rubbing.  
We have no hesitancy in recommending Harbor Super Plycrete to be the most economical concrete form material.  
Very truly yours,  
JOHN KERNS CONSTRUCTION CO.  
(Signed) John T. Kerns.

Super-Harbord, as many contractor-users know, is hot-pressed with a resinoid bond absolutely insoluble to water—guaranteed against ply separation. In every respect it is superior to ordinary lumber. It knocks the spots off costs of erecting all concrete structures including bridge piers and docks, retaining walls, spandrels, stair beams, and floors because:

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2. Large panels make forms go up faster.
3. Smoother surfaces and tight joints save costly rubbing and finishing.
4. Super-Harbord gives more strength under stress and strain.

Get acquainted with Super-Harbord now . . . there are plenty of contractors who are cutting plenty of costs with Super-Harbord.

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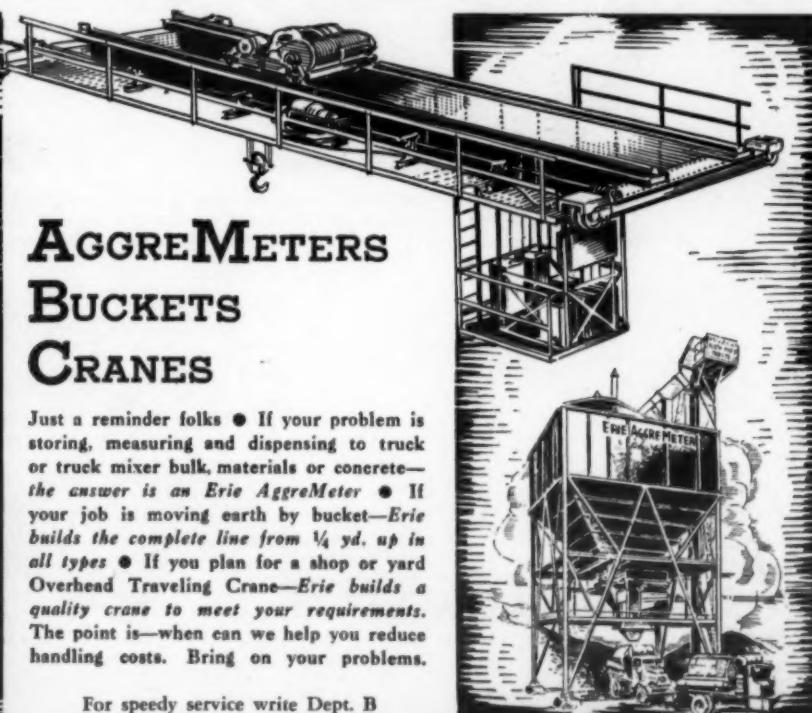
## AGGREMETERS BUCKETS CRANES

Just a reminder folks • If your problem is storing, measuring and dispensing to truck or truck mixer bulk materials or concrete—the answer is an Erie AggreMeter • If your job is moving earth by bucket—Erie builds the complete line from 1/4 yd. up in all types • If you plan for a shop or yard Overhead Traveling Crane—Erie builds a quality crane to meet your requirements. The point is—when can we help you reduce handling costs. Bring on your problems.

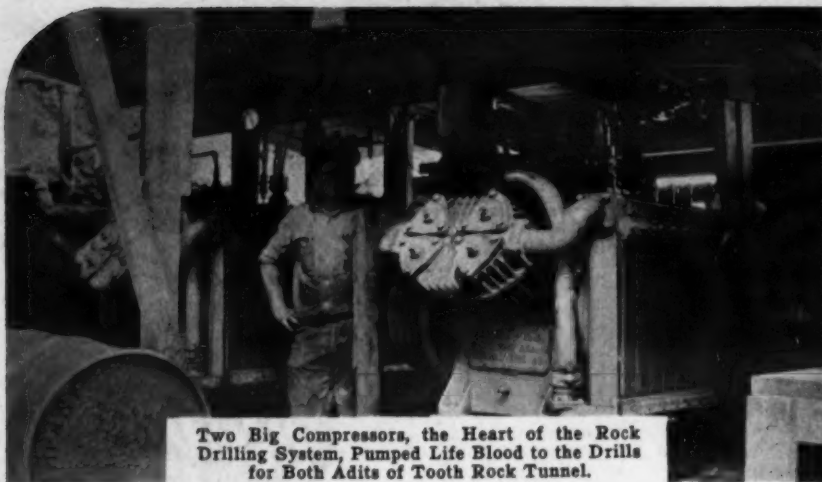
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**ERIE STEEL CONSTRUCTION CO., ERIE, PENNA.**

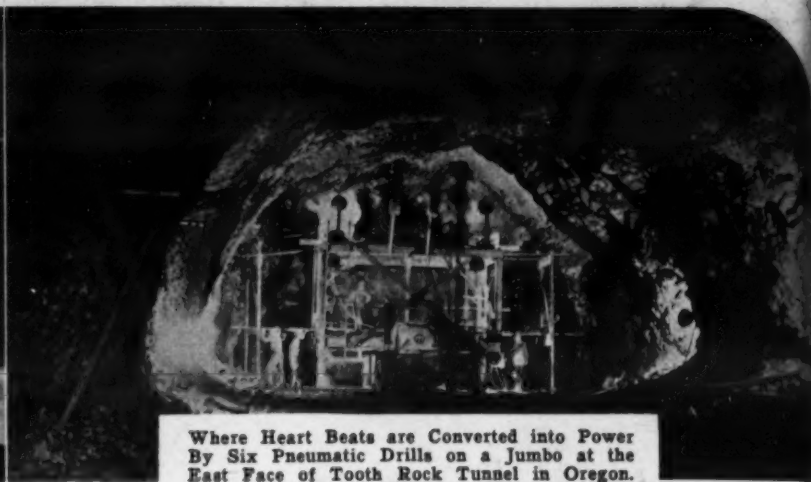
Strayer Electric Buckets, Overhead Electric Cranes, AggreMeters, Clamshell, and Dragline Buckets



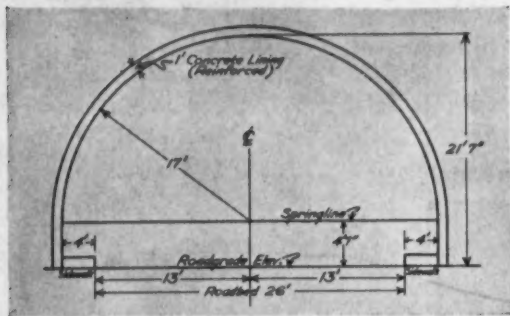
# Contractors and Engineers Monthly



Two Big Compressors, the Heart of the Rock Drilling System, Pumped Life Blood to the Drills for Both Adits of Tooth Rock Tunnel.



Where Heart Beats are Converted into Power By Six Pneumatic Drills on a Jumbo at the East Face of Tooth Rock Tunnel in Oregon.



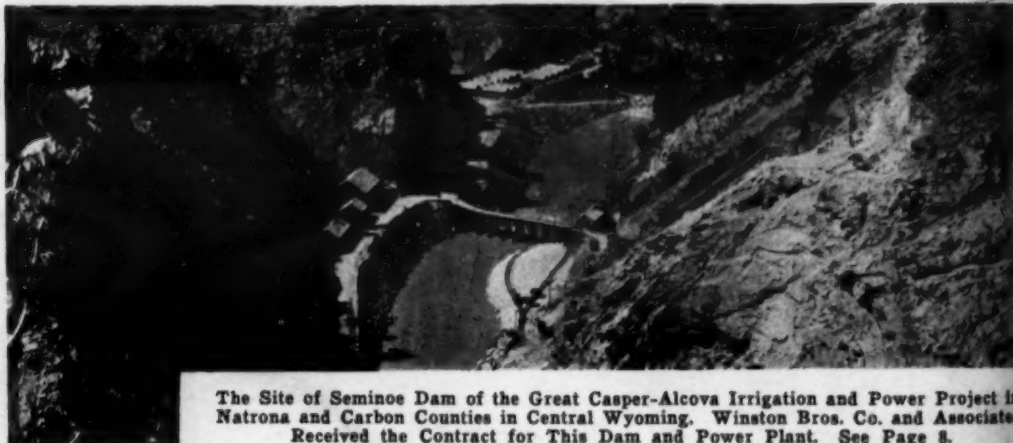
At Left Is a Cross Section of the 827-Foot Tooth Rock Tunnel on the Columbia River Highway near Bonneville Dam Which Orino, Birkemeier & Saremal, Contractor, Is Speeding to Completion. Rock at the Two Ends of This Tunnel Is Widely Different and the Old Road Is Immediately Above One of the Portals, Creating a Number of Interesting Problems. See Page 2. At the Right, the Only Shovel on the Job, a  $\frac{3}{4}$ -Yard Machine, Which Hustled from One Face to the Other in State on Its Own Trailer.



C. & E. M. Photos

Batches with Special Cement Bags (Left) on Their Way to the Paver (Center) and One of the Expansion Joints (Right) on the Shaul Contract. See Page 1.

Santa Ynez Canyon Quarry Which Produces Rock for Bank Protection in Los Angeles County. See Page 1.



The Site of Seminole Dam of the Great Casper-Alcova Irrigation and Power Project in Natrona and Carbon Counties in Central Wyoming. Winston Bros. Co. and Associates Received the Contract for This Dam and Power Plant. See Page 8.



C. & E. M. Photo

One of the Seven Large Paved Parking Areas on the New Highway Along the West Shore of the Widened Cape Cod Canal, Affording an Unusual View of the Canal with the Bourne Bridge in the Background. See Article on Page 2.